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PICEANCE BASIN RESOURCE MANAGEMENT PLAN

MANAGEMENT SITUATION ANALYSIS

WHITE RIVER RESOURCE AREA
OIL SHALE PROJECTS TEAM
JULY 8, 1983

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MANAGEMENT SITUATION ANALYSIS OF THE PICEANCE BASIN RESOURCE MANAGEMENT PLAN

NOTE TO READERS:

Enclosed is the Management Situation Analysis (MSA) for the Piceance Basin Resource Management Plan. The MSA has been reviewed by the Craig District Office and the Colorado State Office. All applicable comments and corrections have been incorporated.

For the Piceance Basin RMP, the Management Situation Analysis has not been prepared as a separate shelf document, but has been developed as part of the Draft RMP itself. It is therefore, divided into two sections: Description of the Piceance Basin Planning Area (which is equivalent to the Affected Environment of an EIS or the Resource Area Profile in the planning regulations), and the Current Management Alternative (which corresponds to the No Action Alternative in an EIS or the Existing Management Situation in the planning regulations). These two sections have been prepared as they will appear in the final document. Many of the maps and acreage figures that will appear in the Draft RMP are not yet available, and will be added at a later date. Additional modifications may also be required as the Management Situation changes between now and the publication of the Draft RMP.

Any questions, clarifications or problems with this document should be directed to John Singlaub, Team Leader, at 878-3601.

B. Curt Smith

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White River Resource
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CHAPTER II -- DESCRIPTION OF THE PICEANCE BASIN PLANNING AREA

A. General Location Description

The Piceance Basin Planning Area is part of the White River Resource Area, Craig District, in northwest Colorado. The area is comprised of some 805,900 acres of land primarily within Rio Blanco County, with a small portion in Garfield County. Of this total land area, BLM administers some 611,600 acres of surface lands or approximately 76 percent of the planning area. Approximately 163,600 acres or 20 percent of the planning area is privately owned land located mainly along the major drainages that feed into Piceance Creek and the White River. The Colorado State Division of Wildlife administers some 26,800 acres or 3.5 percent of the planning area used primarily for game management, studies and public hunting. The U.S. Department of Energy manages the remaining 3,900 acres of the Naval Oil Shale Reserve in the extreme southeast corner of the planning area.

The mineral rights within the planning area are mostly owned by the Federal government and are administered by the BLM. Total mineral lands managed by the Bureau comprise ______________ acres or some ________ percent of the planning area. All lands where BLM manages either the surface or the minerals or both are included in the planning decisions in this Resource Management Plan. Table II-1 shows a breakdown of the surface and mineral ownership of the lands included within the planning area. Table II-2 shows the amount of minerals by type managed by the Bureau.

The Piceance Basin Planning Area is bounded by the White River in the north; State Highway 13/789 to the east; the Roan Plateau and the Grand Junction District, BLM, on the south; and the Cathedral Bluffs to the west.

Figure II-1 shows the location and boundaries of the planning area.

The remainder of this chapter describes the physical environment of the planning area, and the social and economic conditions of the region. In most cases, references are cited where additional information may be obtained. For most resources, more detailed data is available in the Piceance Basin Planning Unit Resource Analysis of the existing Management Framework Plan for the White River Resource Area (USDI, BLM, 1981). This data source has not always been referenced.

B. Physical and Socioeconomic Profile

1. AIR QUALITY

Because air quality and climatic characteristics vary on a regional scale, the following analysis examines a larger area than just the Piceance Basin Planning Area. The existing air quality of the Piceance Basin is typical of undeveloped regions in the western United States; ambient pollutant levels are usually near or below the measurable limits. Notable exceptions in this region include high, short-term concentrations of total suspended particulates (TSP) (primarily wind blown dust), ozone (O_3) and carbon monoxide (CO),

TABLE II-1
LAND AND MINERAL OWNERSHIP

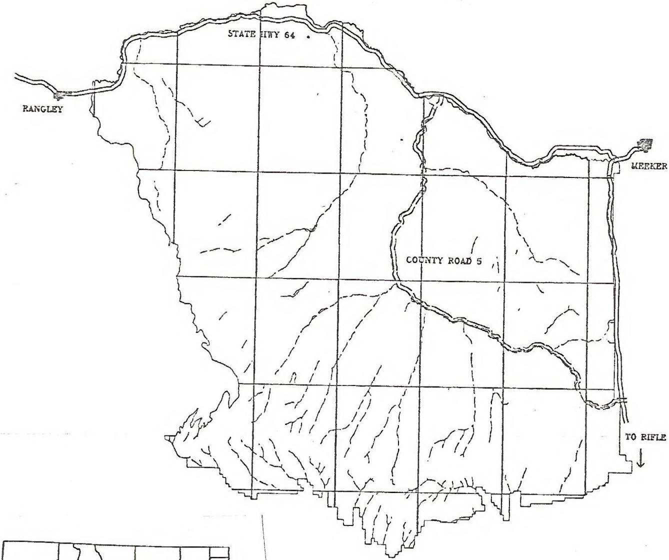
Ownership	Acres in Rio Blanco County	Acres in Garfield County	Total	Percent of Total
Private Surface				
State Surface (Colo. Division of Wildlife)				
Federal Surface (BLM)				
DOE (Naval Oil Shale) Surface and Minerals				
Non-Federal Surface/ Non-Federal Minerals				
Private Surface/ Private Minerals				
Federal Surface/ Federal Minerals				
Federal Surface/ Non-Federal Minerals				

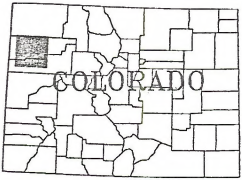
TABLE II-2
FEDERAL MINERALS

	Acres in Rio Blanco County	Acres in Garfield County	Total	Percent of Total
Oil and Gas Only				
Coal Only				
All Minerals				
Oil, Gas and Coal Only				
Other				

Figure II-1

PICEANCE BASIN PLANNING AREA





MAP LOCATION

especially in nearby towns. Locations vulnerable to decreasing air quality from extensive energy-related resource development include the immediate operation areas (coal mines, shale oil retorts, etc.), local population centers with their induced impacts, and distant areas which can be affected through long-range transport of pollutants.

National and state ambient air quality standards limit the total amounts of specific pollutants (CO, lead, nitrogen dioxide (NO_2), O_3, sulfur dioxide (SO_2) and TSP). These standards were established to protect public health (primary standards) and public welfare (secondary standards). Areas which consistantly violate minimum standards because of man-caused activities are classified as Non-attainment Areas, and must implement a plan to reduce ambient levels below the maximum pollution standards (Table II-3). To protect areas not classified as Non-attainment, Congress established a system for the Prevention of Significant Deterioration (PSD) through the Clean Air Act Amendments of 1977.

Areas were classified by the additional amounts of TSP and SO_2 degradation which would be allowed. Class I areas, predominately National Parks and certain Wilderness Areas, have the greatest limitations; virtually any degradation would be significant. Areas where moderate, controlled growth can take place were designated as Class II. Class III areas are those areas which allow the greatest degree of impacts. Most of the study region is Class II and Grand Junction is a Non-attainment Area for TSP.

Class I areas closest to, and predominately downwind from the Piceance Basin are the Maroon Bells-Snowmass, Flat Tops and Mount Zirkel Wilderness Areas. Although they have Class II PSD status, other areas of special concern include Dinosaur and Colorado National Monuments and the Raggeds Wilderness Area. These areas are shown in Figure II-2. Arches and Canyonlands National Parks are also Class I areas, but their geographic and meteorologic relationships to the Piceance Basin Planning Area make them less susceptible to air quality degradation from development activitiy in the Basin.

The State of Colorado has also established standards to limit additional air quality deterioration by establishing SO_2 increments in state designated Category I areas. The standard is identical to the Federal PSD Class I SO_2 increments and applicable to the Class I areas in Colorado listed above plus Dinosaur and Colorado National Monuments.

Background concentrations of CO, lead, NO_2, O_3, SO_2 and TSP measured in the region are presented in Tables II-4 and II-5. Higher TSP levels would be expected near towns due to local combustion sources and traffic on unpaved roads, but the significant regional TSP concentrations are probably due to fugitive dust, primarily wind blown, which due to its greater mass settles relatively quickly. Since fugitive dust particulates are larger than those produced in combustion processes, they present a minimal inhalation health threat. The Environmental Protection Agency may alter the existing TSP regulations to reflect this difference by setting standards for particulates less than 10 to 15 microns in diameter, commonly called thoracic particulates and abbreviated T_{15}.

Ozone levels in the Rocky Mountain west are relatively high but of unknown origin. Elevated concentrations may be a result of long range transport from

TABLE II-3
COLORADO AND FEDERAL AIR QUALITY STANDARDS

		Standards (Micrograms Per Cubic Meter)				
	Averaging	Ambient b/		Increments c/		
Pollutant	Time a/	Primary	Secondary	Class I/ Category I	Class II	Class III
Carbon monoxide	8-hour	10,000	--	--	--	--
	1-hour	40,000	--	--	--	--
Lead	Quarterly	1.5	--	--	--	--
Nitrogen Dioxide	Annually	100	--	--	--	--
Ozone	1-hour	240	--	--	--	--
Sulfur Dioxide	Annual	80	--	2	20	40
	24-hour	365	--	5	91	182
	3-hour	--	1,300	25	512	700
Total Suspended Particulates	Annual	75	60	5d/	19	37
	24-hour	260	150	10	37	75

---

a/ Short term standards (those other than Annual and Quarterly) are not to be exceeded more than once each year.

b/ Ambient standards are the absolute maximum levels allowed to protect either public health (primary) or welfare (secondary).

c/ Prevention of Significant Deterioration standards are the maximum incremental increase levels allowed above the baseline amounts of pollutants in regions of clean air.

d/ Total suspended particulate increments are not included in Colorado Category I standards.

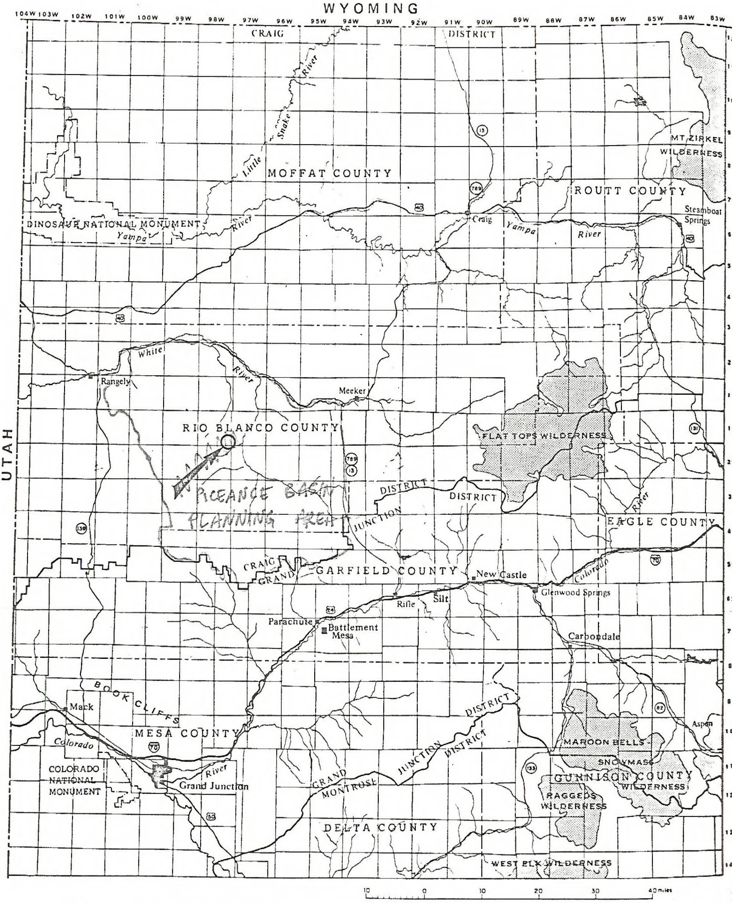


Figure II-2 Northwest Colorado showing Location of Piceance Basin Planning Area, Wilderness Areas, National Monuments in the Region, and Communities That May Be Affected.

TABLE II-4
SELECTED AMBIENT GASEOUS POLLUTANT CONCENTRATION DATA (MICROGRAMS PER CUBIC METER)

Station	Period	Carbon Monoxide				Nitrogen Dioxide		Ozone			Sulfur Dioxide			
		Avg. Time	Ann. Mean	1st Max.	2nd Max.	Ann. Mean	Max.	Ann. Mean	1st 1 hr Max.	2nd 1 hr Max.	Avg. Time	Ann. Mean	1st Max.	2nd Max.
Cathedral Bluffs a/														
#020	1981	1	100	1,800	--	1.0	17	65	161	--	1	3.2	16	--
	1980	1	78	1,700	--	0.7	27	59	122	--	1	2.0	21	--
	1979	1	217	2,300	--	0.5	88	52	192	--	1	0.6	13	--
#023	1981	1	25	1,800	--	2.1	45	77	155	151	1	1.8	31	--
	1980	1	92	3,800	--	0.8	51	75	154	130	1	1.1	21	--
	1979	1	218	3,600	--	1.6	38	76	246	204	1	0.3	49	--
Chevron Tract b/														
#E	10/80-9/81	1	115	5,405	--	3.8	66	69	149	--	1	2.6	21	--
Grand Junction, CO c/														
	1981	1	--	18,400	14,375						3	13	--	52
		8	--	9,660	9,315						24	--	--	21
	1980	1	--	16,100	13,225									
		8	--	7,015	7,015									
Naval Oil Shale Reserve d/														
	6/81-9/81							--	265	--	3	--	118	--
											24	--	69	--
	6/80-9/80							--	206	--	3	--	44	--
											24	--	13	--
Rio Blanco Tract e/														
#1	12/79-11/80	1	575	1,035	--			98	157	--	1	5.2	58	--
	12/78-11/79	1	575	1,725	--			98	157	--	1	26	26	--
	12/77-11/78	1	575	575	--			118	176	--	1	26	79	--
#3	12/79-11/80	1	575	575	--			78	137	--	1	7.9	34	--
	12/78-11/79	1	--	--	--			78	157	--	1	26	236	--
	12/77-11/78	1	--	--	--			78	137	--	1	26	288	--

Note: Underlined values indicate violation of Ambient Air Quality Standards.

a/ Source: Cathedral Bluffs Shale Oil Company 1982, 1981 and 1980.
b/ Source: Environmental Research & Technology, Inc. 1982.
c/ Source: Colorado Department of Health n.d.
d/ Source: TRW Energy Engineering Division 1981.
e/ Source: Gulf Oil Corporation 1981.

TABLE II-5
SELECTED PARTICULATE CONCENTRATION AND COMPOSITION DATA (MICROGRAMS PER CUBIC METER)

Station	Period	TSP				T_{15}			Sulfate			Nitrate			Lead		
		# Obs	Ann. Geo. Mean	1st 24 hr Max.	2nd 24 hr Max.	# Obs	Ann. Geo. Mean	Max.	# Obs	Ann. Arth. Mean	24 hr Max.	# Obs	Ann. Arth. Mean	24 hr Max.	# 1/4	Ann. Arth. Mean	1/4 Max.
Cathedral Bluffs a/																	
Site 020	1981	--	14	69	--												
	1980	--	10	--	--												
	1979	--	16	63	--												
Site 023	1981	--	14	86	--												
	1980	--	11	--	--												
	1979	--	16	81	--												
Chevron b/																	
Site A	10/80-9/81	--	11	227	224	--	4	--									
Site E	10/80-9/81	--	21	--	--												
Colorado Nat'l Monument k/																	
	1980	78	16	42	37												
	1979	86	15	67	62												
	1978	54	15	39	33												
Craig, Courthouse																	
	1981	83	87	--	230												
	1980 c/d/e/	71	86	382	238				69	5.9	11.2	69	1.7	5.9			
	1979	41	93	206	170				24	3.5	5.6	24	1.1	1.6			
Glenwood Springs, Courthouse c/d/																	
	1981	83	63	--	198												
	1980	88	68	203	199												
	1979	85	57	188	173												
Grand Junction, Rood St. c/																	
	1981	84	77	--	232	65	57	194							4	.70	1.0
	1980	72	78	--	144				72	4.8	9.8	72	2.1	8.4	4	.75	1.0
	1979	83	82	183	176				64	4.4	12.6	64	3.8	30.7	4	1.0	1.5

TABLE II-5
SELECTED PARTICULATE CONCENTRATION AND COMPOSITION DATA (MICROGRAMS PER CUBIC METER)

	TSP				T15			Sulfate			Nitrate			Lead		
Station Period	# Obs	Ann. Geo. Mean	1st 24 hr Max.	2nd 24 hr Max.	# Obs	Ann. Geo. Mean	Max.	# Obs	Ann. Arth. Mean	24 hr Max.	# Obs	Ann. Arth. Mean	24 hr Max.	# 1/4	Ann. Arth. Mean	1/4 Max.
Grand Valley, High School c/e/																
1978	51	55	213	208												
1977	35	(52)	334	217												
1976	78	71	361	342												
Meeker, Courthouse																
1981	77	59	--	134												
1980 c/d/f/	70	66	212	171												
1979	--	--	--	--												
Naval Oil Shale Reserve g/																
6/81-9/81	14	(24)	37	--	14	14	29							--	.01	--
6/80-9/80	--	--	30	--										--	.01	--
Rangely, Water c/d/ Treatment Plant e/																
1980	15	(70)	273	162												
1979	22	(130)	342	324												
1978	57	57	285	187												
Rifle, Third Ave c/																
1981	80	99	--	411												
1980 d/e/	69	156	510	479										2	--	0.5
1979	83	128	694	660				66	3.6	12.2	66	1.8	10.6	4	.72	1.2

TABLE II-5
SELECTED PARTICULATE CONCENTRATION AND COMPOSITION DATA (MICROGRAMS PER CUBIC METER)

		TSP				T_{15}			Sulfate			Nitrate			Lead		
Station	Period	# Obs	Ann. Geo. Mean	1st 24 hr Max.	2nd 24 hr Max.	# Obs	Ann. Geo. Mean	Max.	# Obs	Ann. Arth. Mean	24 hr Max.	# Obs	Ann. Arth. Mean	24 hr Max.	# 1/4	Ann. Arth. Mean	1/4 Max.
Rio Blanco Tract h/																	
Site 1	12/79-11/80	--	13	61	--												
	12/78-11/79	--	11	303	--												
	12/77-11/78	--	14	59	--												
	2/75-1/77	--	9	211	--												
Site 3	12/79-11/80	--	18	96	--												
	12/78-11/79	--	21	192	--												
	12/77-11/78	--	26	160	--												
	2/75-1/77	--	15	281	--												
Rio Blanco e/																	
	1975	--	13	111	--												
	1973	--	14	144	--												
Steamboat Springs, Sixth St. c/																	
	1981	32	(155)	--	549										2	--	0.4
	1980	68	134	--	433				64	6.3	16.4	64	2.0	7.6	4	.38	0.5
	1979	62	118	518	450				51	4.0	10.9	51	1.9	6.7	3	--	1.3
Superior Tract i/																	
	12/76-11/77	--	40	647	--											.3	j/

Note: Underlined values indicate violation of Ambient Air Quality Standards, parentheses indicate insufficient data to determine reliable average.

a/ Cathedral Bluffs Shale Oil Company, 1982, 1981 and 1980.
b/ Environmental Research & Technology, Inc., 1982.
c/ Colorado Department of Health, n.d.
d/ Systems Applications Inc, 1982.
e/ Woodward-Clyde Consultants, 1981.
f/ Engineering-Science, Inc, 1974.
g/ TRW Energy Engineering Division, 1981.
h/ Gulf Oil Corporation, 1981.
i/ USDI, Bureau of Land Management, 1979.
j/ Concentration based on single sample.
k/ Lundy, 1982.

urban areas, subsidence of stratospheric ozone, or due to photochemical reactions with natural hydrocarbons. The true reason for elevated ozone values is uncertain, however. In addition to ozone, occasional peak concentrations of CO and SO_2 occur in the region, and may be attributed to combustion equipment near monitors.

Class I PSD regulations also address the potential for impacts to Air Quality Related Values (AQRV). These AQRV's include visibility, odors, and impacts to flora, fauna, soils, water, geologic and cultural structures. A possible source of impact to AQRV's is acid deposition. Tables II-6 and II-7 summarize the existing levels of visibility and acid deposition of the study region.

Visibility impacts can occur from atmospheric increases in small, light-scattering particles or increases in light absorbing gases (typically NO_2). Mechanisms of acid precipitation formation are currently under study. Preliminary results have correlated ambient sulfuric and nitric acids with combustion by-products (sulfates and nitrates).

In summary, annual average concentrations (micrograms per cubic meter) in rural regions of the study area range as follows: TSP 10 to 40, SO_2 0.3 to 3, and NO_2 2 to 30. Twenty-four hour average values range: 80 to 130 for TSP and 50 to 130 for SO_2. One hour average concentrations of ozone and CO range from 118 to 160 and 1000 to 2300 respectively. Average lead concentrations vary from 0.05 to 0.06 quarterly. Developed areas have nearly the same values with the following exceptions: average TSP concentrations range from 80 to 130 annually and 115 to 440 for 24 hours; NO_2 annual average concentrations range from 2 to 50; average one hour CO values may reach 20,700; and urban lead averages vary from 0.5 to 0.8 quarterly. Recent measured extremes appear in Tables II-4 and II-5.

2. CLIMATE

The Piceance Basin is located in a semi-arid, continental climate regime, characterized by dry air, sunny days, clear nights, little precipitation, extreme evaporation and large diurnal temperature changes. Because of the surrounding mountains, low pressure storm systems tend to pass around the region, whereas high pressure cells stagnate, blocked by the Rocky Mountains, resulting in moderate temperatures and abundant sunshine. The region's complex topography causes considerable variation in site-specific temperature, precipitation, and winds, but these influences are less on the plateaus than down in the valleys. Severe weather conditions such as tornadoes, floods, damaging hail, winds and thunderstorms are rare.

Temperatures vary mostly with elevation, and to a lesser extent, local microclimate. Generally, summer temperatures range from lows of 6°C (45°F) to highs of 30°C (85°F). Winter temperatures range from -15°C (5°F) to 2°C (35°F). Extreme temperatures may fall as low as -40°C (-40°F) or up to 38°C (100°F). Frost-free periods vary from year to year and by location, but tend to range from 60 to 150 days.

Annual precipitation in the Piceance Basin is highly variable; ranging from 20 to 60 cm (8 to 24 inches), with slightly more than half of the moisture coming from scattered spring and late summer thundershowers. Snowfall amounts vary

TABLE II-6
SELECTED VISUAL RANGE DATA (Km) e/

Station	C-a/C-b a/ Photographic	Chevron b/ Nephelometer	Chevron b/ Radiometer	Colorado N.M Radiometer c/	Dinosaur N.M. Radiometer c/	Craig, CO c Radiometer
Spring 1975-76	-/111/-					
Fall 1975-76	-/147/-					
Spring 1978	-/127/-					
Fall 1978	-/129/-					
Spring 1979	-/124/-					99/128/167
Summer 1979					146/179/242	98/131/174
Fall 1979	-/135/-				153/192/274	88/124/174
Winter 1980					d/	84/99/116
Spring 1980	-/126/-			e/	d/	86/133/205
Summer 1980				130/176/238	95/150/238	104/139/185
Fall 1980	-/150/-			145/197/267	146/203/283	93/146/230
Winter 1981		-/344/-	-/180/-	145/215/317	d/	109/178/288
Spring 1981	-/135/-	-/200/-	-/210/-	d/	d/	190/172/272
Summer 1981		-/250/-	-/170/-	120/166/229	95/135/192	101/147/214
Fall 1981	-/140/-	-/200/-	-/195/-	d/		99/158/252
Winter 1982						77/127/207
Spring 1982						115/175/268
Summer 1982						110/160/234

a/ Source: Gulf, 1981, and Stevens, 1982. Measurements taken during intensive studies each spring and fall at an elevation of nearly 2100 m. Average of several targets.

b/ Source: Vertstuyft, 1982. Radiometer Measurements taken of Flat Tops Wilderness; nephelometer at an elevation of nearly 2600 m. Data is averaged quarterly (i.e., winter is January through March, etc.)

c/ John Muir Institute, n.d. Measurements are taken daily of several targets and adjusted to a standard visual range elevation of 1550 m.

d/ Insufficient data.

e/ Data is presented as 10th/50th/90th percentile values

TABLE II-7
SELECTED ACID DEPOSITION DATA (pH)

	Craig, CO				Douglas Pass				Grand Mesa				Marvine Ranch				Naval oil Shale Res.			
Season	# Obs	Mean	1st Min	2nd Min	# Obs	Mean	1st Min	2nd Min	# Obs	Mean	1st Min	2nd Min	# Obs	Mean	1st Min	2nd Min	# Obs	Mean	1st Min	2nd Min
Spring 1979	2	5.21	5.00	5.63																
Summer 1979	7	4.89	4.48	4.65																
Fall 1979	10	4.79	4.23	4.65																
Winter 1980/81	15	5.10	4.74	4.81	4	5.92	5.50	6.09	12	5.21	4.52	5.00	16	5.25	4.60	4.72	2	5.72	5.64	5.81
Spring 1980/81	26	4.90	4.30	4.33	6	5.14	4.75	5.18	2	5.51	5.27	6.13	7	5.59	4.86	5.47	1	4.93	-	-
Summer 1980/81	21	4.88	4.32	4.45	4	4.63	4.41	4.50	1	5.26	-	-	7	4.81	4.49	4.74	3	5.15	5.03	5.05
Fall 1980/81	17	5.03	4.62	4.70	3	5.66	5.40	5.60	2	5.13	4.88	5.82	5	4.86	4.39	4.85	3	5.09	4.78	5.14
Winter 1982	6	5.43	5.04	5.20																

Sources: Natural Resources Ecology Laboratory n.d., and Turk 1982.

from 64 to 380 cm (25 to 150 inches); snowcover is commonly redistributed by wind. At lower elevations, limited data indicate that evaporation exceeds precipitation, with the driest conditions occurring in mid-summer.

Upper-level winds predominate from the southwest, but surface wind patterns are almost entirely dependent on local terrain and ground cover. Persistant winds with little directional modification are found on the plateaus, but winds in valleys show strong drainage influences (Figure II-3). Synoptic (pressure gradient) winds may be forced around hills or channeled through valleys, but if there are no strong gradient flows, diurnal upslope/downslope winds predominate.

Upslope winds usually occur on sunny mornings when the air at higher elevations heats rapidly and rises. Downslope winds occur when the air near the ground cools, becomes dense, and sinks downward along drainages. In the Piceance Basin, downslope winds are common and stronger than their upslope counterparts.

Air basins have been defined based on these drainage winds, indicating areas of similar atmospheric flow, topographic influence and general dispersion potential. Under stable conditions, pollutants tend to collect and concentrate in an air basin until regional synoptic winds disperse the air between basins. Generally, Piceance Creek downslope winds flow into the Craig Air Basin in the north and the Roan or Parachute Creek downslope winds flow south into the Colorado River Basin (PEDCO Environmental 1981).

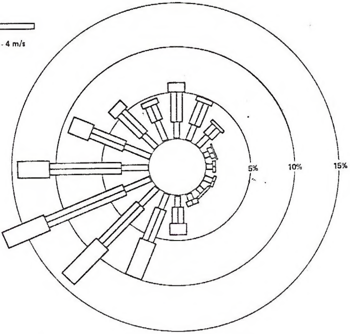
The extent that vertical and horizontal mixing will take place is related to the atmospheric stability and mixing height. Distributions of these factors from selected locations near the study area are presented in Tables II-8 and II-9. Unstable conditions occur under conditions of strong surface heating, typical of summer afternoons, producing upslope winds. Neutral conditions reflect a breezy, well-mixed atmosphere. Stable conditions are enhanced by rapid radiative cooling and downslope drainage, producing the least amount of dispersion. Inversions may exist under stable conditions, trapping pollutants within a certain layer of air. In the Piceance Basin, moderate inversions are formed during the summer in the evening and dissipate at dawn.

Winter inversions are stronger and last longer; an episode lasting three to six days may be expected (USDI, BLM 1976). Inversions are enhanced by weak pressure gradients, cold clear nights, snowcover and lower elevations.

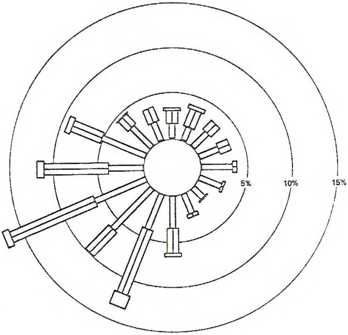
3. GEOLOGY

GEOLOGIC HISTORY

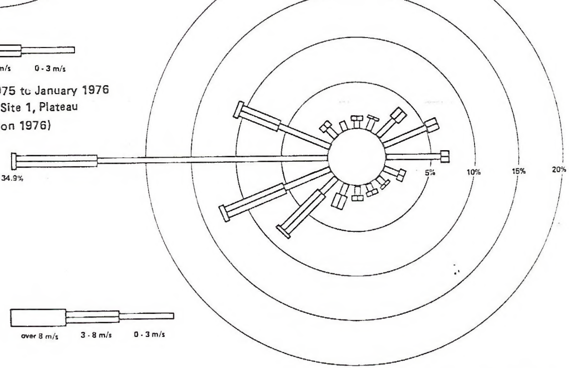
This section briefly identifies the stratigraphy and structure of the Piceance Basin which are important when analyzing the mineral resources and geologic hazards associated with mineral development. A more detailed description of the stratigraphy and structure of the Piceance Basin is available in Murray and Haun (1974), Johnson and Keighin (1981), Sanborn (1981) and Cole and Ochs (1981).



Wind Rose of Annual 700 millibar (mb) Winds at
Grand Junction, Colorado (Engineering Science 1974)



Wind Rose of February 1975 to January 1976
Ten Meter Winds at C-a Site 1, Plateau
(Gulf Oil Corporation 1976)



Wind Rose of February 1975 to January 1976 Ten Meter Winds at
C-a Site 3, Valley (Gulf Oil Corporation 1976)

Figure II-3

TABLE II-8
FREQUENCY OF STABILITY CLASSES AT 500 METERS ABOVE GROUND LEVEL

Station/Season		Morning (percent)			Afternoon (percent)		
		Unstable	Neutral	Stable	Unstable	Neutral	Stable
Cathedral Bluffs Tract							
	Annual	10	55	34	19	55	27
	Spring	11	61	28	34	54	12
	Summer	13	51	36	45	32	23
	Fall	10	61	29	17	63	21
	Winter	2	48	50	6	69	25
Craig	Annual	2	39	60	16	64	20
	Spring	5	56	39	31	54	14
	Summer	0	21	80	14	66	20
	Fall	2	37	61	13	69	18
	Winter	0	43	57	6	65	29
Grand Junction	Annual	2	52	46	1	84	15
	Spring	1	68	31	0	96	3
	Summer	0	57	43	0	98	2
	Fall	1	49	50	0	91	9
	Winter	6	33	62	3	51	47

Source: Systems Applications, Inc. 1982. Percentages may not add to 100 percent due to rounding errors.

TABLE II-9
SELECTED MIXING LAYER HEIGHT DATA

Station/Season	Morning (Meters above ground level)	Afternoon (Meters above ground level)
Grand Junction a/		
Annual	384	2,600
Spring	628	3,166
Summer	307	3,940
Fall	273	2,133
Winter	329	1,160
Rio Blanco Tract b/		
Annual	450	---
Spring	935	---
Summer	179	---
Fall	196	---
Winter	290	850

a/ Source: Systems Applications, Inc. 1982
b/ Source: Gulf Oil Corporation 1976

The Piceance Basin covers an area of approximately 7,500 square miles of the Colorado Plateau Province of northwest Colorado. Over 25,000 feet of sediments have accumulated in the Basin ranging in age from the Cambrian period to the Eocene Epoch. It is part of a larger complex of Laramide Age (Cretaceous) basins including the Green River Basin in Wyoming and the Uinta Basin in Utah (Figure II-4).

At the end of the Cretaceous period and during the early Tertiary period (Paleocene and Eocene) various mountain building activities formed the structural features observed today in northwest Colorado. During the Eocene Epoch, the oil shales of the Green River Formation were deposited in the intermontane structural depressions known as Lake Gosiute (Green River Basin) and Lake Uinta (Uinta and Piceance Basins). In the late Eocene Epoch, Lake Uinta filled with volcanic clastic debris, sands and silts. These sediments are now known as the Uinta Formation which is the youngest formation now found in the Piceance Basin.

Table II-10 illustrates all the stratigraphic formations and units currently recognized in the Piceance Basin. Formations of economic interest will be discussed under the Minerals section below.

MINERALS

The Piceance Basin Planning Area contains significant deposits of oil shale, nahcolite, dawsonite, halite, oil and gas, and coal.

Leasable Minerals

Oil Shale

Approximately 80 percent (1.2 trillion barrels) of the shale oil resources of the Eocene Green River Formation are located in Piceance Basin, Colorado. Shale oil resources in the Piceance Basin Planning Area alone have been estimated at over 600 billion barrels for oil shales containing 15 gal/ton or more of shale oil. The higher grade oil shales range in thickness from 10 to 2,000 feet with overburdens ranging from 0 to over 1,600 feet (Murray and Haun 1974). The thickest sections of oil shale and the thickest intervals of overburden occur in the deepest portion of the Basin which is located approximately in the center of the planning area. Approximately 82 percent of the oil shale resources located in the planning area are managed by the Bureau of Land Management (Table II-11).

Saline Minerals

The saline facies of the Green River Formation which include nahcolite ($NaHCO_3$), dawsonite ($NaAl(OH)_2CO_3$) and Halite ($NaCl$) in association with oil shale are located within the planning area (see Figure II-5 and Figure II-6). The saline minerals are found in the lower part of the Parachute Creek Member as crystalline aggregates and coarse-grained beds. These saline minerals are disseminated throughout the oil shale matrix.

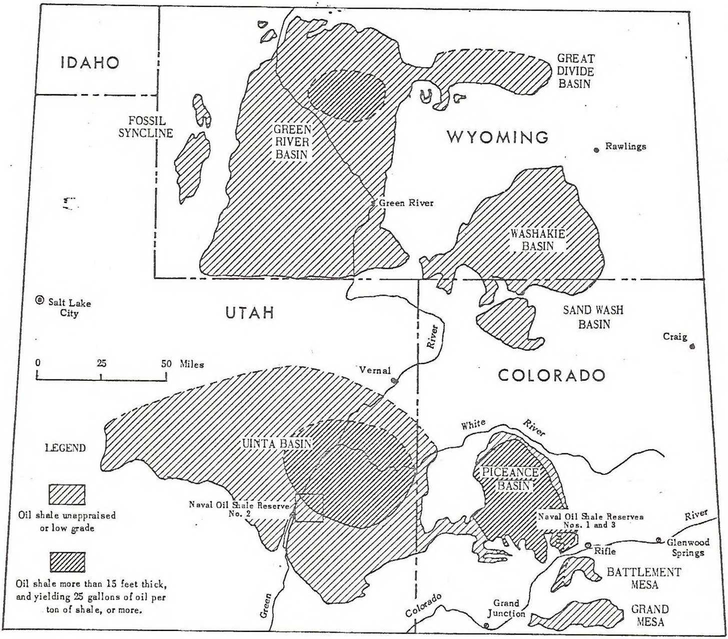


Figure II-4 Portions of the Cretaceous-Tertiary Basins of Northwest Colorado, Southwest Wyoming And Northeast Utah Containing Low And High Grade Oil Shale (F.C. Jaffe 1962).

TABLE II-10
GENERALIZED STRATIGRAPHIC UNITS OF PICEANCE BASIN

System	Series	Group	Formation	Member	Lithology
Tertiary	Eocene		Uinta	(Formerly called Evacuation Creek)	Sandstone, siltstone and marlstone.
			Green River	Parachute Creek	Marlstone, sandstone and saline facies.
				Garden Gulch	Sandstone, siltstone
				Anvil Pts	
				Douglas Ck	Sandstone, siltstone
	Paleocene		Wasatch		Shale
			Fort Union Ohio Creek		Shale
Cretaceous	Upper	Mesaverde	Williams Fork		Sandstone, shale and coal.
			Iles	Sego	Sandstone
			Mancos	Buck Tongue	Shale
				Castlegate	Sandstone, shale
				Mancos	Shale Sandstone.
				Frontier	Sandstone
	Lower			Mowry	Shale
			Dakota		Sandstone
Jurassic	Upper		Morrison		Sandstone, Shale
				Salt Wash	Sandstone, Shale
			Curtis		Sandstone
			Entrada		Sandstone
	Middle		Glen Canyon	Formerly Navaho	Sandstone
Triassic	Upper		Chinle	Gartra	Red sandstone/shale
					Red sandstone/shale
	Lower		Moenkopi		Calcareous shale and sandstone.
Permian	Upper		Park City		Sandstone, Shale and Limestone
Pennsylvanian	Lower		Weber		Sandstone
			Minturn-Morgan		Limestone, Shale
Mississippian	Lower		Leadville		Limestone.
Devonian	Upper		Chaffee	Dyer	Limestone.
				Parting	Quartzitic sandstone
Ordovician			Manitou		Limestone.
Cambrian	Upper		Dotsero		Limestone, dolomite.
	Lower		Sawatch-Lodore		Quartzitic sandstone

TABLE II-11
PICEANCE BASIN PLANNING AREA MINERAL STATUS

Mineral Ownership	Acres	Percent
Private		
Colorado Division of Wildlife		
Public Land (BLM)		
Total		

(Source: USDI, BLM 1978).

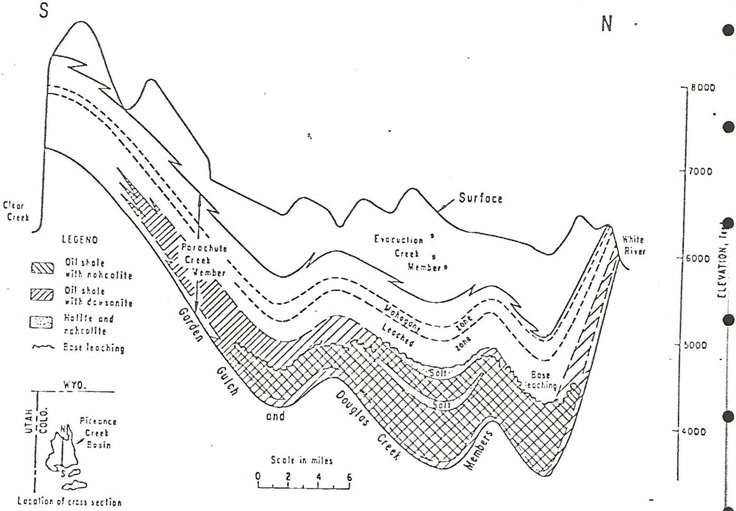
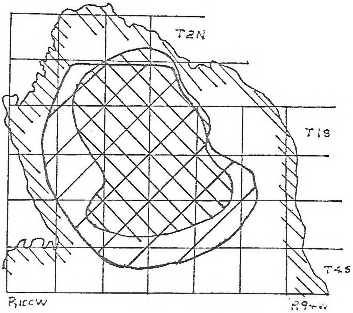


Figure II-5
South-north diagrammatic section showing nahcolite, dawsonite, and halite distribution in the Piceanc Creek basin, Colorado. (Source: Beard et al, 1974)

Figure II-6
Saline Zone of Northern Piceance Basin
(Adapted from Beard et al, 1974)



▨ Outline of Green River Formation

▨ Outline of Dawsonite Reserves

▨ Outline of Nahcolite Reserves

An estimated 29 billion tons of nahcolite are located within the planning area (Beard et al 1974). Nahcolite could be used for various industrial uses; the most important being the removal of SO_2 from coal-fired power plant stack gases.

Approximately 19 billion tons of dawsonite have been estimated to occur in the Piceance Basin in association with nahcolite (Beard et al 1974). Dawsonite is a potential source of alumina.

Halite is also found in the Basin in association with nahcolite and dawsonite. At present, interest in the halite has been almost non-existent.

Oil and Gas

Occurrences of oil and gas resources within the Piceance Basin Planning Area are common. Most sandstones in the late Cretaceous appear capable of producing gas over much of the Basin (Johnson and Keighin 1981). Gas production presently predomnates in the Basin. However, some oil has been obtained from almost every producing formation. Formations presently producing oil and/or gas include the Morrison Formation, Dakota Sandstone, Mancos Formation, Mesaverde Group, Wasatch Formation, and the Green River Formation. Generally, drilling depths in the Basin have been limited to the Dakota Sandstone, however numerous shows and oil stains have been encountered in older formations and the possibility of production from these older formations exists. Figure II-7 shows oil and gas fields in the Piceance Basin.

Coal

Cretaceous coals have been mined in many places within the Piceance Basin, although none are being mined from the planning area at present. No Tertiary coal has been reported in the Piceance Basin, although the Wasatch and the Green River Formations contain coal in the Washakie-Sand Wash Basin of northwestern Colorado and southwestern Wyoming.

In-place reserves were estimated for the Basin by the United States Geological Survey to a depth of 3,000 feet. Total reserves below 3,000 feet is unknown, however, coal resources below 3,000 feet are extensive (Landis 1959) and future technology may yet find a method to develop them economically. Original reserves in the Basin were estimated to be 1.7 billion tons of mainly high-volatile B and C Bituminous ranked coal. With the exception of the periphery of the Basin, all coal-bearing formations are covered by at least 3,000 feet and in many cases over 6,000 feet of overburden (Speltz 1974).

Asphalt

Tar sands or rock asphalt is found along the eastern edge of the planning area in the Petrolite Hills (Figure II-7). The asphalt is deposited as layers between sandstone beds of the Lower Green River Formation, as veins and exposed as seeps in the sandstone (USDI, BLM 1978). Quality and quantity are

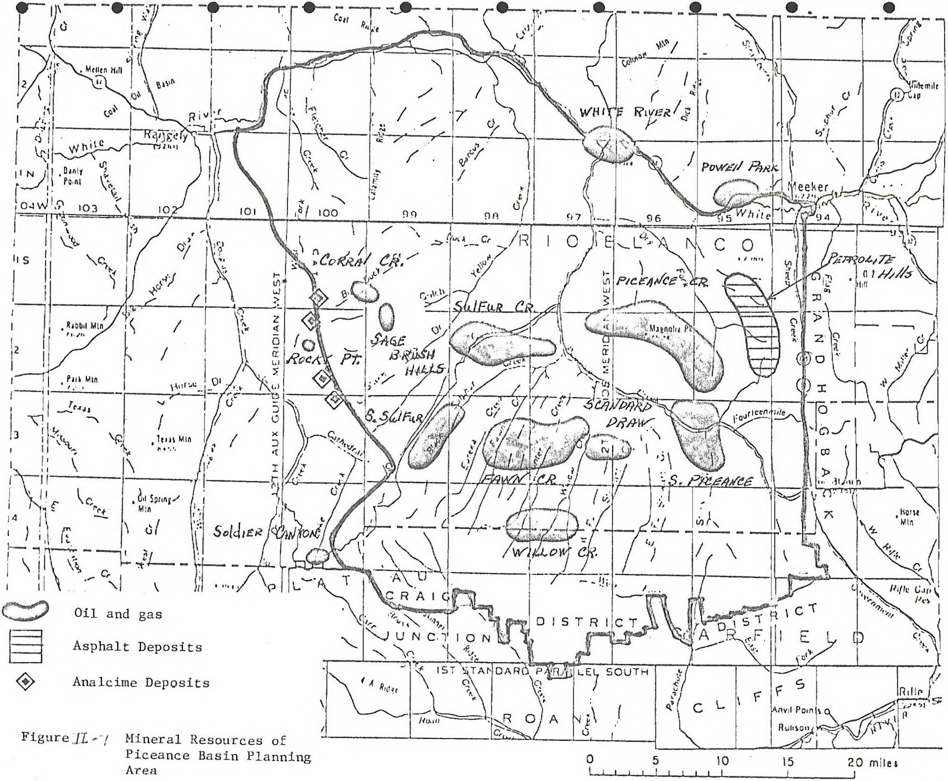


Figure II-7 Mineral Resources of Piceance Basin Planning Area

unknown; however, the deposits in the Petrolite Hills and north of the planning area in the Gray Hills are possibly the largest in Colorado.

Analcime (Analcite)

The zeolite analcime [$Na(AlSi_2O_6)H_2O$] occurs in tuffs and oil shales of the Green River Formation within the planning area (Figure II-7). The deposits are minor and are not considered commercially valuable at this time (USDI, BLM 1982c). The mineral may be leased for sodium or located as a zeolite pursuant to the General Mining Law of 1872 for alumina. Zeolites, both artificial and natural, are used as gas absorbants, drying agents, water softeners, and are useful in pollution control.

Locatable Minerals

Being a predominately sedimentary structure, the Piceance Basin is not noted for areas of magmatic, metamorphic or hydrothermal mineralization. However, some sedimentary mineralization is present within the planning area including uranium-vanadium, limestone-dolomite and gypsum.

Uranium-vanadium ore has been mined from the Skull Creek, Colorado area, near Rifle, Colorado, and east of Meeker, Colorado, all of which are outside the planning area. The mineralization is found within the Jurassic Entrada, Curtis and Morrison Formations. These formations are found at depth beneath the planning area, however, quality and quantity of any mineralization is unknown. No significant commercial quantities of uranium-vanadium can be expected to be found in this area (Del Rio 1960).

At present, no market for the limestone-dolomite has been demonstrated, furthermore the deposits are located too deep within the planning area to be considered valuable.

Gypsum deposits are located within the Wasatch Formation in the planning area. These deposits are generally too thin to be considered a commercial commodity.

Saleable Minerals

Sand and gravel deposits consisting of colluvium and alluvium occur throughout the planning area. Alluvial deposits are found primarily along the drainages of the White River and various creeks of the Piceance Basin or on the benches and terraces above the drainages. Colluvial deposits can be found at the base of almost every rock outcrop and within the alluvial fans associated with the various drainages.

Scoria, a naturally baked clay resulting from in-place burning of coal beds can be found along some portions of the periphery of the planning area. Both sand and gravel, and scoria are used for road construction and maintenance.

An almost unlimited amount of building stone and riprap is located within the planning area. The Uinta, Green River and Mesaverde Formations all contain considerable suitable sandstone units.

Clay deposits of the Wasatch Formation and the Mesaverde Group are located within the planning area. Quality and quantity are unknown; however, both formations offer possible sources of this resource should a market develop in this area.

GEOLOGIC HAZARDS

Landslides

Landslide potential exists in any area with steep slopes. Of special significance are areas where steep dip-slope conditions (dip of strata is approximately equal to slope) exist. Areas within the planning area especially susceptible to landslides include Cathedral Bluffs, Roan Cliffs, Calamity Ridge and along the Grand Hogback (Colton et al 1975, Carrara et al 1975).

Seismicity

The planning area is considered to be in an area of low seismicity. This is based on the fact that no major earthquakes have occurred or originated from the area in the last 110 years.

Subsidence

Ground subsidence may be caused by natural phenomena such as removal of underground fluids, natural consolidation of sediments or dissolution of underground minerals. More commonly, subsidence is caused by man-made phenomena such as underground mining and removal of fluids such as oil and water from subsurface reservoirs. Presently, no areas of natural or man-made subsidence have been identified in the planning area however, future underground mining of oil shale, saline minerals and coal could produce noticeable ground subsidence.

4. TOPOGRAPHY

The term "Piceance Basin", as used in this document, identifies an area of approximately 1,600 square miles that is bounded on the north by the White River, on the east by the Grand Hogback, on the south by the Roan Plateau and on the west by Cathedral Bluffs and Calamity Ridge. Most of the Piceance Basin Planning Area is located within the White River drainage, with the southern fringe draining south into the Colorado River. It is a mountain basin ranging in elevation from about 5,400 feet near Rangely, Colorado to over 8,500 feet on the Roan Plateau.

Prominent features throughout the planning area include Calamity Ridge, Cathedral Bluffs, Roan Plateau, Joe Bush Mountain, Bar D Mesa, 84 Mesa, Magnolia and Segar Mountain. The Basin's topography is characterized by a series of nearly parallel north and northeasterly trending ridges and valleys with local elevation differences ranging from 200 to 600 feet. Overall aspect of the Basin is northern.

Cathedral Bluffs, which is on the west side of the Basin, is a long ridge of steep bluffs which extends from near the White River to the Roan Plateau. The bluffs have a few high points which exceed 8,000 feet in elevation.

The southern end of the Basin is the Roan Plateau which extends generally east and west from Douglas Pass to the Grand Hogback. A few places along this area exceed 8,500 feet in elevation.

The east side of the planning area is mostly rolling type mountains extending to the Grand Hogback which is a north-south ridge just outside the planning area that parallels Colorado State Highway 13/789.

Piceance Basin (part of the Colorado Plateau), was subjected to vertical uplift in relatively recent geologic time. As a result, it now appears in relief as a large shallow bowl lying atop the Roan Plateau. The edges of the Basin lie near the rim of the plateau and, as a result, streams draining the exterior faces of the plateau are short, few in number, and exhibit steep gradients. Piceance and Yellow Creeks and their tributaries, which drain the Basin proper, are longer and more gently sloping. The rest of the Basin is characterized by echelon drainages cutting their way through to Piceance Creek leaving fairly narrow stream valleys which are sediment laden. These drainages radiate clockwise from the southeast corner around to the northwest corner of the area.

The major drainage for the planning area is the White River. Only two tributaries to the White River stand out as significant, draining approximately 90 percent of the Basin. The largest of these tributaries, for which the Basin has its name, is Piceance Creek. Piceance Creek has its headwaters east of the Grand Hogback. It cuts through the hogback in the southeast corner of the Basin and flows generally northwesterly to about the center of the Basin where it flows northward to its confluence with the White River about 18 miles west of Meeker, Colorado. Piceance Creek has dozens of smaller tributaries which create the many ridges and valley combinations which exist throughout the Basin. The planning area is somewhat unique in that it is almost entirely drained by Piceance Creek which is a tributary to the White River.

The other tributary is Yellow Creek which has its headwaters along the Cathedral Bluffs. Yellow Creek flows generally to the northeast from Cathedral Bluffs then northerly to its confluence with the White River about halfway between Meeker and Rangely, Colorado.

5. FLOODPLAINS AND ALLUVIAL VALLEYS

Floodplains in the Piceance Basin Planning Area are not extensive because most streams flow through steep, narrow valleys. There are approximately 160 miles of stream channels on public land designated as potential floodprone areas with drainage areas of greater than five square miles within the planning area. Total public lands along the main channels of the White River, Piceance and Yellow Creeks which have a history of flooding, is less than 15 miles. The potential for flooding exists throughout the Basin, with major events resulting from high intensity localized thunderstorms.

Runoff from these storms can be quite high as shown by a 6,800 cubic feet per second (cfs) instantaneous discharge measured at Yellow Creek near the White River Station on September 7, 1978. The U.S. Army Corps of Engineers (1982-1983) has analyzed portions of the Basin for floodplains. Their floodplain delineations, as shown in Figure II-8, are based upon a 100 year flood occurrence and a minimum watershed of five square miles.

Alluvial valleys are topographically low areas which have a thick mantle of unconsolidated sediments (colluvium and alluvium) and receive additional runoff moisture from upland areas. This additional moisture and the generally gentle slopes make some of these alluvial valleys suitable for subirrigated or flood irrigated agricultural production (principally hay meadows).

Alluvial valleys are known to exist within the major drainages of the Piceance Basin, usually in association with floodplains or in flood-prone areas. The exact location and extent of the alluvial valleys has not been determined in the planning area.

Most of the irrigated alluvial valleys in the Basin are used for hay production which is of importance to the local livestock industry. Hay production makes it possible for livestock operators to feed their herds when no other forage is available during the winter months. Some alluvial valleys, which have not been developed for agricultural use, produce riparian vegetation which is important to wildlife (USDI, BLM 1983).

6. AGRICULTURAL LANDS

The irrigated lands along the White River and Piceance Creek are used to produce alfalfa and grass hay for livestock and to provide winter pasture. Irrigation water comes from the White River and its tributaries. Non-irrigated cropland is used primarily for dryland wheat, with a small amount of barley production. Most non-irrigated cropland is in the eastern half of Rio Blanco County.

The Important Farmlands Map of Rio Blanco County (USDA, SCS and Colorado State University Experiment Station 1979) shows that no prime or important farmlands occur on public land in the study area. However, prime farmlands are located in scattered segments along Piceance Creek from Hunter Creek to Dry Fork, and along the White River from Meeker west through Powell Park. No unique farmlands are present within Rio Blanco County. Irrigated hayland and pasture of statewide importance occurs in the drainages of Piceance, Black Sulphur and Yellow Creeks and the White River. Figure II-9 shows the locations of prime farmland and farmlands of Statewide Importance.

FIGURE II-8

Floodplain Delineation - 100 year

FIGURE II-9
LOCATION OF PRIME FARMLAND AND FARMLANDS OF STATEWIDE IMPORTANCE

A figure will be generated from the MOSS data base showing all prime farmlands and farmlands of statewide importance in the planning area.

The estimated 1983 cropland acreage in the area (Jones 1983 and USDI, USFWS 1983) that may be affected is shown in Table II-12:

TABLE II-12
ESTIMATED 1983 CROPLAND ACREAGES

	Irrigated		Dryland	
County	Acres	Percent	Acres	Percent
Rio Blanco County				
Garfield County				
Mesa County				

The public lands administered by the Bureau of Land Management in the Piceance Basin have little or no potential for use as cropland and none of the public land has ever been cultivated. Some of the soils have a marginal potential for use as dryland cropland but they have one or more of the following limitations:

1) A short growing season less than 90 days,
2) high erodibility by water,
3) high sodium or salt content in the profile,
4) some slopes greater than six percent, and/or
5) some soils with more than 10 percent of the surface with rock fragments coarser than 3 inches (USDA, SCS 1982).

Agricultural lands of particular importance in this region are the 10,000 acres of orchard lands in Mesa County that are considered Unique Farmland of National Importance by the Soil Conservation Service.

7. SOILS

INTRODUCTION

The soil resources within the Piceance Basin are extremely variable depending on parent materials, elevation, slope, aspect, location on slope and time in place. The soils within Rio Blanco County in the Piceance Basin were mapped to Order III which consists mainly of associations, complexes and consociations (USDA, SCS 1982). The Order III soil survey was mapped on a scale of 1:24,000 with a minimum size delineation of about six acres. Completed detailed maps and soil series and mapping unit descriptions are found in the Rio Blanco County soil survey (USDA, SCS 1982). The detailed maps and descriptions are available from the Soil Conservation Service and are on file at the Craig District and the White River Resource Area office. The Garfield County portion of the Piceance Basin will be surveyed during the summer of 1983.

DESCRIPTION OF MAJOR SOIL GROUPS

The majority of information contained in this section has been compiled from information received from the Soil Conservation Service in the form of Rio Blanco County Soil Survey and Soil Interpretation forms. The following descriptions are for three broad areas that have a distinctive pattern of soil characteristics, relief, vegetative cover and drainage. Each land type has a unique natural landscape. The soils making up one unit can occur in other soil units but are located in a different pattern. Those broad areas can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the detailed survey maps.

BOTTOMLAND SOILS ON FLOODPLAINS, TERRACES, ALLUVIAL VALLEY FLOORS AND FANS

This group of soils makes up ____ percent of the planning area. These soils occur along the major drainages and tributaries on nearly level to moderately steep slopes. The native vegetation is mainly willows, shrubs and grasses.

The soils in this group are generally of recent depoisition and show few diagnostic horizons. They are formed in mixed alluvium from sedimentary rock, are deep (at least 60 inches thick) and well drained. The alluvium derived from shale is fine textured and generally calcareous throughout. They are slightly to moderately affected by salt and alkali. The alluvium derived from sandstone is stratified medium to coarse textured and can have rock fragments throughout.

The main limitations for production of this group is the lack of irrigation water, a short growing season, some saline areas, and scattered areas with a seasonal high water table and flooding hazard.

SOILS ON FOOTHILLS IN CENTER OF PICEANCE BASIN

This group of soils makes up ____ percent of the planning area. These soils are gently sloping and include numerous entrenched narrow valleys and canyons that have very steep slopes. They are generally well drained with a low available water holding capacity. These soils have formed in place or from alluvium and wind deposited material derived from calcareous sedimentary rocks. The native vegetation is mainly pinyon, juniper, mountain brush, sagebrush and grasses.

The soils occurring on ridges and hills are shallow and formed on residuum derived dominately from sandstone. The pofile contains many stones is generally calcareous throughout, medium textured and underlain by sandstone at 10 to 20 inches. The soils developed on shale are generally steeper, finer textured and underlain by shale at 10 to 20 inches. There are also areas of very steep slopes of shallow soil which are almost barren.

The soils formed on uplands and terraces in open sagebrush parks are deeper, well drained and formed in alluvium and from wind deposited material. They are medium textured loams on the surface underlain by moderately fine to fine textures to a depth of 60 inches.

The main limitations for production of this soil group is the short growing season, low precipitation during the growing season, shallow depth to bedrock, high wind and water erosion hazard, steepness of slope and areas of rock-outcrop which restrict accessibility.

SOILS ON MOUNTAINS BORDERING THE WEST AND SOUTHERN BOUNDARIES OF THE PICEANCE BASIN

This group of soils makes up ____ percent of the planning area. These soils are gently sloping to very steep shale cliffs of the Cathedral Bluffs. The soils in this group are dry and less developed at lower elevations grading into deep, dark colored soils at upper elevational ranges with recently developed soils occurring on wind swept ridges and steep valley sides. These soils are formed in alluvium, and in place from sedimentary rock. The native vegetation is mainly mountain brush and shrubs with an understory of grasses.

The soils occurring on ridges and mountain sides are generally shallow and well drained. They are sloping to very steep and formed in place from sandstone and hard shale. The surface layer contains may stones and is medium textured underlain by extremely channery and medium textured material to a depth of 10 to 40 inches. The soils on uplands occupy gentle slopes, are deep and well drained. They formed in colluvium from sandstone and hard shale. The surface layer is medium textured underlain by soils that are channery to very channery medium textured to a depth of about 50 inches.

The main limitations for production of this group are steepness of slopes, shrink-swell potential, low permeability, high wind and water erosion hazard and hazard of landslides.

SOIL MOISTURE

In the semi-arid environment of the Piceance Basin, moisture is in short supply for at least part of each growing season and limits plant growth. In this environment, the ability of a soil to hold moisture is at least as important as nutrient availability. Finer textured soils (loam and clay loams) are more effective at holding moisture than coarser textured soils (sandy loams, rocky sand loams, and very rocky sandy loams). Soils on steep slopes will generate more runoff than gently sloping soils. The runoff is not available to plants on sites from which it runs off, however, bottomland soils in concave areas receive additional moisture from runoff during periods of moisture recharge. All of these areas tend to have thicker and more strongly developed horizons, are more strongly leached, and are darker in color. Because of these moisture relationships, the bottomland soils are more productive than sideslopes or uplands because they have more moisture than is available from precipitation.

SOIL EROSION

Soil erosion is controlled by many factors, including climate, vegetative cover, inherent erodibility of the soil and the land use. Of these factors, land use and plant cover are most directly under human control. By reducing plant cover or changing land use, management can accelerate erosion above natural rates. This can cause a reduction in productivity of eroded sites and downstream sedimentation problems.

Most of the erosion in the Piceance Basin occurs during the spring snowmelt and during intense summer thunderstorms causing run-off and flash flooding. Many of the streams in the Piceance Basin have cut deep channels since settlement of the area. Many of these channels continue to erode from gully migration upstream and from the channel bank caving in. Upland erosion also occurs due to sheet and rill erosion.

Water erodibilities of the soils are quite variable. The silt and silt loam surface textures are most susceptible to water erosion. Soil with a high content of coarse fragments have very low inherent water erodibility. In addition, fine sands, loamy sands and coarse sandy loams are most susceptible to wind erosion.

SEDIMENT YIELD

Soil erosion cannot be directly converted to sediment yields because they do not account for deposition of material prior to its entrance to perennial water courses. The Colorado Land Use Commission (1974) compiled data on sediment yield, defined as the average annual amount of sediment from a square mile transported by water from source areas into local water coarses. The Piceance Basin sediment yield is shown below in five different categories and represents an average over 25 years or more.

1. Severely eroding stream banks and gullies with an average depth of five feet or more yield from 1.0 to 2.0 acre feet per bank mile per year. This occurs along Yellow Creek, portions of Piceance Creek and their tributaries.

2. Very high yield (1.0 to 3.0 acre-feet per square mile per year) includes badlands or other severely eroded lands with extensive sheet and rill erosion and numerous deep gullies. These locations are found only in a small area of the Piceance Basin.

3. High yield (0.5 to 1.0 acre-feet per square mile per year) includes the majority of the center of the Piceance Basin which is rangeland with much sheet and rill erosion and numerous shallow to moderately deep gullies.

4. Moderate yield (0.2 to 0.5 acre-feet per square mile per year) includes the area at middle elevational range in the Piceance Basin. This is mostly rangeland with only a few shallow to moderately deep gullies and some rills and gullies.

5. Low yield (0.1 to 0.2 acre-feet per square mile per year) includes the area on Cathedral Bluffs and the Roan Plateau. These areas have good vegetative cover and only occasionally gullies or sites with obvious sheet and rill erosion.

8. HYDROLOGY

The Piceance Basin Planning Area lies in the White River Drainage Basin of the Green River Sub-basin and the Upper Colorado River Basin. Piceance and Yellow

Creeks, the two major drainages of the Piceance hydrologic basin are tributaries to the White River.

SURFACE WATER QUANTITY

Distribution of precipitation in the Piceance Creek structural basin is significantly affected by elevation. Areas where the elevation is greater than 8,000 feet, such as along the Roan Plateau and Cathedral Bluffs, receive as much as 26 inches of precipitation per year, mostly as snow in the winter months. Areas between about 5,500 and 8,000 feet elevation generally receive from 12 to 20 inches of precipitation annually.

Cover conditions that affect the watershed in the planning area vary from isolated densely forested drainages to nearly barren desert areas. The major vegetation classifications (and elevation ranges) that fall within the representative watershed are (1) desert shrubs (4,500 to 6,500 feet), (2) pinyon, juniper, sagebrush (6,000 to 8,000 feet), and (3) oakbrush, aspen, Douglas fir, and sagebrush (7,000 to 9,000 feet). Watershed runoff and total water yield are generally related to the same factors of elevation, exposure, land use and climate that produce the variations in vegetation cover.

Precipitation in the form of snowfall accumulates during winter months at higher elevations and produces a period of high recharge to the groundwater system and high streamflow in early spring. Surface water runoff is greatest during this spring snowmelt season and lasts until early July. Stream flow for the remainder of the year is maintained almost totally by groundwater discharge, with approximately 80 percent of the surface flow in the Basin being supplied by groundwater (Robson and Saulnier 1981).

Because evapotranspiration rates are extremely high during the summer months, only high intensity thunderstorms produce any significant contributions to summer streamflows.

The drainage area of Piceance Creek is 652 square miles as measured 900 feet upstream from the mouth which is 13 percent of the White River Basin. Average annual flow of the Piceance Creek at the White River streamflow station is 18,110 acre feet (13 year record) or about four percent of the average annual flow of the White River. Minimum and maximum daily discharges for the same 13 year period are 0.75 and 628 cfs respectively (USDI, USGS 1981).

Yellow Creek is the smaller of the two streams within the Piceance hydrologic basin. The drainage area as measured 0.3 miles upstream from the mouth of Yellow Creek is 262 square miles. Average annual flow is 1,350 acre feet (10 year record) to the White River. Minimum and maximum daily discharges for the period 1972-1981 range from no flow to an abnormally high flood peak of 6,800 cfs which occurred in 1978. For more information see the Floodplains section in this Chapter.

Stream and channel characteristics in the lower elevations (northerly portion) of the unit are meandering, causing bank caving, sloughing and steep banks. This adds considerably to the sediment loads in the streams during periods of high runoff. These occurrences are during rapid snowmelt and early spring runoff, as well as during occasional intense summer thunderstorms. In the higher elevations of the southern portion of the planning area, the streams and channels tend to be straight, less incised, with bottoms and banks covered with vegetation. The upper elevations are in a higher precipitation zone, consequently the increased density of vegetation is evident and aids in reduction of flood runoff and reduces soil loss.

The majority of the reservoirs, lakes, ponds and water control structures are totally dependent upon surface runoff for their water supply, although few of these ponds are supplied by springs, seeps and wells. Lake and reservoir depths vary throughout the unit; however, most of the stock water and wildlife ponds are less than 15 feet. The bottoms of the lakes and reservoirs in the higher elevations are generally in good condition with very little siltation occurring. The reverse is true, however, in stockponds at the lower elevations where many livestock reservoirs are receiving sedimentation. Many ponds have already been rendered useless due to sediment filling the ponds to spillway elevation.

Livestock and wildlife needs are usually supplied by the development and use of surface water sources; however, groundwater contributes to some livestock water in the form of developed springs and a few ponds which have groundwater augmentation from springs and seeps.

The major water uses in Piceance and Yellow Creeks at this time are water for livestock and irrigation of hay meadows. Diversions from Piceance and Yellow Creeks, supply water to approximately 5,300 acres. The amount of water diverted and the number of acres irrigated at any one time are functions of water availability, water right priorities, crop type and weather conditions.

SURFACE WATER QUALITY

The surface water quality of both Piceance and Yellow Creeks can be classified as a mixed bicarbonate type in the upper reaches, and a sodium bicarbonate in the lower reaches. The concentration of dissolved solids, fluoride and sodium increase in the downstream direction. Irrigation return flows, evapotranspiration and groundwater discharge from the Green River formation are the main causes of the water quality degradation in Piceance Creek. Increases in the water quality constituents for Yellow Creek are attributed primarily to groundwater inflows (Weeks et al 1974).

Total dissolved solid (TDS) concentrations for both Piceance and Yellow Creeks vary substantially with streamflows. When streamflows are high, (snowmelt periods) TDS concentrations are the lowest. The increases in TDS during low flow conditions are good indications of the discharging of groundwater to the streamflows in both Piceance and Yellow Creeks. The groundwater that discharges into these streams contains trace minerals such as arsenic, barium, boron, fluoride, iron, lithium and strontium in significant concentrations. Lesser concentrations of beryllium, copper, cadmium, lead, mercury, manganese, molybdenum, selenium and zinc were also detected. Primary evaporite minerals and primary and secondary sulfide minerals are likely sources of the trace constituents found in the groundwater (Robson and Saulnier 1981).

Table II-13 displays the maximum and minimum TDS in mg/l and annual sediment yields in Tons/square mile for Piceance and Yellow Creeks for the water year 1980, for the days sampled.

TABLE II-13
CHARACTERISTICS OF MAJOR STREAMS

Characteristics	White River Near Ouray, UT	Piceance Creek at White River	Yellow Creek Near White River
Drainage Area (Square miles)	5,120	652	262
Average Annual Discharge (cfs) 1/	241,880	10,518	660
Maximum Daily Discharge (cfs) 1/	4,200	186	500
Minimum Daily Discharge (cfs) 1/	110	0.70	0
Average Daily Discharge (cfs) 1/	662	28.8	1.81
Maximum Instantaneous Discharge (cfs) 1/	4,260	628	6,800
1980 Sediment Discharge (tons) 2/	2,046,110	56,115	12,495
Maximum Daily Sediment Discharge (tons/day) 1/	268,000	2,900	290,000
Minimum Daily Sediment Discharge (tons/day) 1/	0.69	0.10	0
Maximum TDS (milligrams per liter) 1980 2/	702	1,710	2,090
Minimum TDS (milligrams per liter) 1980 2/	261	731	489

1/ For the period 1975-1980.

2/ 1980 water year.

Source: USGS Water Resource Data

Conversion: cfs x 1.9835 = acre feet.

GROUNDWATER QUANTITY

The Piceance Basin Planning Area includes the drainage basins of Piceance, Yellow, Roan and Parachute Creeks. These formation of Eocene and older rocks lie directly beneath the drainage basins in the planning area. The Uinta and Green River Formations consist of marlstone, sandstone and siltstone and include large reserves of oil shale. Extensive fracturing and leaching of the formations has increased their permeability and resulted in aquifers that lie within, above and below the oil shale deposits.

The principal usable bedrock aquifers which occur in the planning area are commonly referred to as the upper and lower aquifers of the Uinta and Green River Formations, respectively (Figure II-10). These aquifers are considered isolated from one another by the semi-impermeable oil shale rich layer referred to as the Mahogany Zone. The Uinta Formation is exposed over most of the Basin; the Green River and older formations are exposed in the Basin margins and in numerous incised valleys within the drainages of Roan and Parachute Creeks (Taylor 1982).

The Uinta Formation consists of fractured sandstone, marlstone and siltstone that contain groundwater in porous or fractured bedrock and is considered the main groundwater recharge system to the upper aquifer. Isolated perched aquifers exist throughout the Piceance Basin within the Uinta Formation, although the extent and locations are not well known.

The underlying Green River Formation which contains the lower aquifer is subdivided into members that include the Parachute Creek Member, the Garden Gulch Member and the discontinuous Anvil Points Member. The Parachute Creek Member consists of fractured marlstone, sandstone and leached zones which contain groundwater. This member includes many small discontinuous oil shale lenses; and the Mahogany Zone which is the largest oil shale rich layer in the Basin. The Garden Gulch Member consists of relatively impermeable marlstone, shale and sandstone layers that form the base of the aquifer system. The Anvil Points Member in the eastern portion of the Basin is a relatively impermeable zone equivalent to the lower Parachute Creek Member, Garden Gulch Member and the underlying Douglas Creek Member.

A zone of saline minerals known as the high-resistivity zone exists in the lower portions of the Parachute Creek Member in the north-central part of the Basin. This zone is relatively impermeable and probably consists of unfractured marlstone ranging from 200 to 900 feet in thickness (Coffin et al 1971). Above the high-resistivity zone lies the low-resistivity or leached zone that has been fractured, allowing groundwater circulation and resulted in relatively high permeability.

Fractures are common in the aquifers and less common in the Mahogany Zone. Fractures are important hydrologically because groundwater moves more readily through the fractures than through the pores of the rocks. Therefore the permeability is mostly due to fractures; and directional trends in fractures will cause directional variations in permeability. The solutional zones in

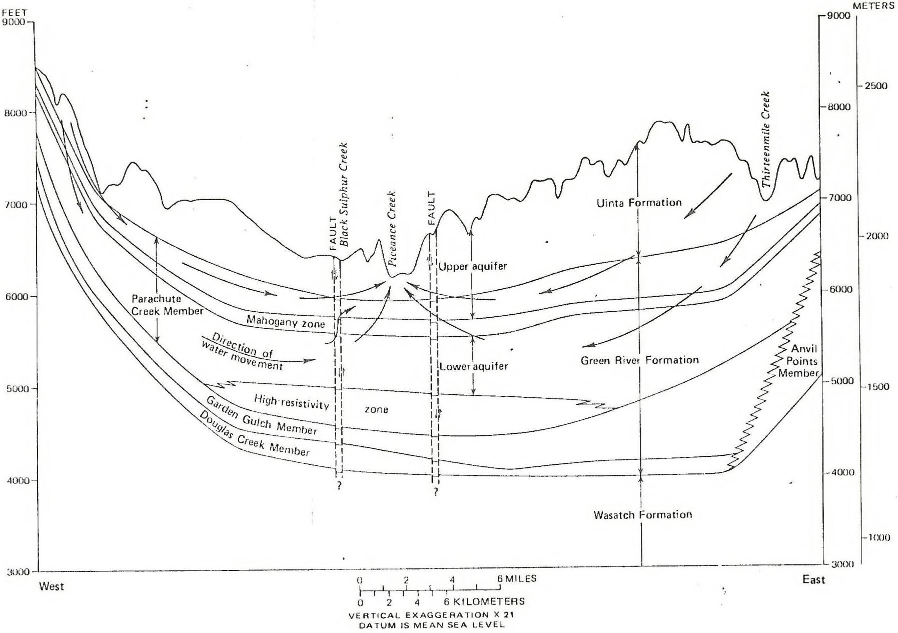


Figure II-10 Geohydrologic Section Through the Piceance Basin Showing Relation of the Aquifers to the Green River and Uinta Formations (Weeks et al 1974)

the lower aquifers also are important hydrologically because they widen the fractures, thereby increasing the premeability, porosity and specific yield of affected zones. The solutional activity as evidenced by cavities in the rock, probably served to change the hydraulic characteristics of the lower aquifer in comparison to the upper aquifer (Taylor 1982).

Water occurs in alluvial aquifers throughout the planning area along stream channels. These aquifers are generally less than one-half mile in width with thickness of up to 140 feet and a saturated thickness of up to 100 feet (Coffin et al 1971). Water in the alluvium occurs under both water table and confined conditions, depending on the occurrence of clay beds in some reaches (Weeks et al 1974). Alluvial well yields vary with time as valleys narrow and valley walls act as relatively impermeable boundaries. Total well yields in all aquifers within the planning area are dependent upon depth, fractured areas, transmissivities and the areal extent of the aquifer.

Groundwater recharge within the Piceance Basin results from the melting of relatively thick snowpacks above 7,000 feet elevation (Weeks et al 1974). Part of this recharge flows through the upper aquifer to major streams. While the remaining recharge flows downward through the relatively impervious Mahogany Zone into the lower aquifers and then upward through the Mahogany Zone and upper aquifer to the major streams.

According to Robson and Saulnier (1981), groundwater recharge rates vary throughout the Basin. In the northeast portion where the topography is broad rolling uplands dissected by steep narrow canyons, recharge rates are in the range of 2.0 to 3.2 inches per year. The remaining Basin rim made up of the Cathedral Bluffs and the Roan Plateau have rates of 0.1 to 1.0 and 1.0 to 2.0 inches depending upon location, topography, soils and vegetation density.

Groundwater outflow from the system basin-wide is upward from the lower aquifer through the Mahogany Zone to the upper aquifer. Water is then discharged to the streams from the upper aquifer through the alluvium or springs. Groundwater is lost from the Basin by evapotranspiration or discharge from Piceance and Yellow Creeks. According to Weeks et al (1974), no significant amount of groundwater discharges to the White River directly from the Green River Formation, except through Piceance and Yellow Creeks.

Current use of groundwater within the Basin is minimal. Groundwater discharge accounts for over half the base flow in the major basin drainages and is indirectly the primary source of water for hay meadow irrigation and animal use along the major drainages. Other groundwater uses are for domestic and livestock watering wells. There are numerous springs and seeps which supply water for livestock and wildlife. Because of the large number of springs in the Basin, the reader is referred to a report prepared for the U.S. Geological Survey by the Colorado State Engineer (1978) entitled Piceance Basin Spring Hydraulics Investigation.

GROUNDWATER QUALITY

Groundwater quality in the Piceance Basin varies both within and among the aquifers and also by location. Virtually all 75 reported analyses for

Piceance Basin groundwater (Ficke et al 1974, Weeks and Welder 1974), showed that the concentration of total dissolved solids exceeded the recommended limit of 500 milligrams per liter (mg/l) set by the U.S. Public Health Service. Most water, though, is suitable for livestock and wildlife.

Groundwater in the alluvial aquifer may be classified as a sodium bicarbonate type with concentrations of dissolved solids ranging from 470 mg/l to a high but not persistent level of 6,720 mg/l. Average levels of dissolved solids are nearer to 1,750 mg/l over the entire Basin (Weeks and Welder 1974). Higher averages were obtained downstream toward the White River, attributed mainly to irrigation water reentering the alluvium return flows, groundwater interfaces with bedrock aquifers and concentrations by evapotranspiration (Weeks et al 1974).

Groundwater in the upper aquifer may also be classified as a sodium bicarbonate type. Generally, with aquifer depth and northerly direction, concentrations of dissolved solids increase ranging from 400 mg/l to 2,000 mg/l (Weeks et al 1974). This increase may be attributed to the solution of minerals and by groundwater movement upward from the lower aquifer (Weeks et al 1974). Calcium, magnesium and sulfate concentrations in the upper aquifer are greater than in the lower aquifer.

The total dissolved solids of the lower aquifer vary from 500 mg/l to nearly 40,000 mg/l, and are dependent upon depth and solution cavities. Dissolved solids concentrations of 63,000 mg/l have been reported from a sample obtained from the high resistivity zone (Weeks et al 1974).

The lower aquifer water can be classified as a sodium bicarbonate type. The lower aquifer has higher concentrations of chloride and much higher fluoride concentrations than the upper aquifer. The fluoride concentrations in the lower aquifer are worth noting. The average fluoride concentration for 27 wells sampled in the Basin is 28 mg/l. It is rare to have fluoride concentrations greater than 10 mg/l. Like the upper aquifer, lower aquifer water in the north central portion of the Basin is of poorer quality than that of the Basin margins (USDI, BLM 1983).

The concentration of some trace elements within the lower aquifer are great enough to be of environmental concern. Concentrations of barium, boron and lithium are consistently high in the northern part of the Basin, indicating that minerals containing these elements may be associated with nahcolite and halite (Weeks et al 1974). Concentrations of barium exceed drinking water standards in 7 out of 11 wells sampled by Weeks et al. The boron and lithium levels are high enough to be toxic to most plants.

MUNICIPAL WATERSHEDS

Two major water storage and diversion projects are slated for the White River. These are the Taylor Draw Reservoir near Rangely and the Yellow Jacket Project upriver from Meeker.

The Taylor Draw Reservoir is to provide a dependable municipal, agricultural and industrial water supply to water users within the boundaries of Water User's Association No. 1, including the town of Rangely, to provide needed flood control, recreation and a source of hydroelectric power in the future. A total of 13,800 acre-feet of storage on the White River was applied for and granted by the State of Colorado at the dam site.

The Yellow Jacket Project calls for 80,000 acre feet of diversion and storage to the White River. Various plans and alternatives have been proposed but the final decision is pending. The project is to provide water for agriculture, industry and the municipal and domestic needs of the Meeker area. Estimated water delivery requirements were 18,000 ac/ft for irrigation to 8,000 acres of land; 5,000 ac/ft for diversion by municipal and domestic use in the Meeker area; 12,000 ac/ft provided to coal interest and the remaining 52,000 ac/ft provided for oil shale interest in the Piceance and Yellow Creek Basins.

9. VEGETATION

VEGETATION TYPES

Discussion will center around major vegetation types occurring in the planning area with emphasis on existing composition, condition and trend, cover, and productivity. Condition and trend information, presented in Table II-14 refers to livestock forage condition and trend. Figure II-11 depicts the major vegetation types by locality. Methodology for determination of condition and trend can be found in the White River Resource Area Grazing Management Draft Environmental Impact Statement.

Grassland Type

Grasslands occur in the area as a subdominant vegetation type occurring within more extensive plant communities. Grasslands cover about 24,244 acres (4 percent of the planning area). Most stands seldom exceed several thousand acres in size. Grassland openings are common at all elevational ranges but are most prevalent at elevations below 7,000 feet. Major species comprising the type at lower elevations are western wheatgrass and needle-and-thread grass. Above 7,000 feet, major species are subalpine needlegrass, Letterman needlegrass, and various bluegrasses.

The majority of the grassland type (14,369 acres) is in good condition and 9,225 acres are in fair condition. At present, trend is static over most of the type (13,278 acres) but improving on 10,810 acres.

Grass and forb cover averages 31 percent, and ranges from 26 to 38 percent. Production estimates (McKell and Goodin 1973) range from 600 to 2,200 lbs/acre on mountain meadows. Lower elevation grasslands average up to 400 lbs/acre.

TABLE II-14
SUMMARY OF VEGETATION TYPE BY CONDITION AND TREND (FORAGE PRODUCTION) ON PUBLIC LANDS

Vegetation Type	% of Unit Total Acreage	Condition				Trend		
		Poor	Fair	Good	Total	Improving	Static	Declining
Grassland								
Sagebrush								
Mountain Shrub								
Pinyon-Juniper								
Saltbush								
Greasewood								
Broadleaf								
Conifer								
Waste								

FIGURE II-11
LOCATION OF MAJOR VEGETATION TYPES

A figure will be generated from the MOSS data base identifying the location of all Vegetation Types.

Sagebrush Type

The sagebrush type covers approximately 192,361 acres (32 percent) and is the major shrub community in the planning area. Sagebrush stands are characterized by mixed high and low growing shrubs dominated by big sagebrush with a wide variety of understory grasses and forbs. The sagebrush type occurs at all elevations, with the larger expanses occurring below 7,000 feet.

Major plant species associated with sagebrush at lower elevations are western wheatgrass, Colorado wildrye, Indian ricegrass, and needle-and-thread. Associated species above 7,000 feet are various wheatgrasses, bluegrasses, needle grasses and lupine.

Overall condition and trend is fair (125,940 acres) and improving (106,784 acres). Poor condition range occupies 12,504 acres while good condition range covers 53,917 acres. Range trend is static on 83,075 acres and declining on 2,500 acres.

Cover varies throughout the type. In some instances big sagebrush dominates a site, contributing almost 100 percent of the total cover, while on other sites it may contribute less than 20 percent. Cover attributed to all species occurring in the type, based on data, averages 32 percent.

Productivity of the sagebrush type is also highly variable. Dense stands support very little understory vegetation while open stands can produce from 800 to 1,800 lbs/acre.

Mountain Shrub Type

The mountain shrub type, occupying 130,716 acres or 21 percent of the planning area, occurs above 7,000 feet, and is usually most prevalent on north facing slopes along steep ridges and foothills. The major species characterizing the type are Utah serviceberry, Gambel oak, mountain mahogany and snowberry. Major understory species are sedge, arrow-leaf balsamroot, western yarrow and slender wheatgrass.

Fifty-two percent of the mountain shrub type is in good condition while 54 percent has a static trend. Areas in poor condition (1,083 acres) are usually higher elevation stands bordering valley bottoms in the vicinity of water developments. Less than one percent of the type has a declining trend. Depleted understories and decadent shrubs typify poor condition range.

Cover is attributed primarily to overstory species and averages 41 percent. In some areas cover of overstory species is nearly 100 percent and is usually associated with dense stands of Gambel oak.

Productivity in the mountain type is higher than in most of the other vegetation types, due mainly to higher moisture associated with elevation. Production, both herbaceous and browse, ranges from 900 to 1,500 lbs/acre.

Pinyon-Juniper Type

The pinyon-juniper type, occupying 234,920 acres or 35 percent of the planning area, is the most prevalent vegetation type in the planning area. Colorado pinyon, Pinus edulis and Utah juniper, Juniperus osteosperma, are the dominant overstory species. Major understory species include Utah serviceberry, mountain mahogany, big sagebrush, bitterbrush, junegrass and beardless bluebunch wheatgrass.

This type occurs on a wide variety of sites with respect to elevation, slope and aspect. Most are found between 6,500 feet and 8,000 feet in elevation on ridgetops and sideslopes on all aspects wherever acceptable soils exist. The type varies considerably with respect to species composition, wood volumes and forage production. Depending on the quality of the site, the overstory will vary from pure juniper to pure pinyon and all mixtures, from very sparse and scattered to closed canopied, from seedling/sapling stages to large overmature stands. Where a dense overstory occurs, little or no herbaceous understory vegetation occurs, although desirable browse production may be significant. Overall ground cover estimates average 34 percent for the type. Most woodland stands will exhibit variation in size and age classes, due to their unmanaged status. Best development usually occurs in ridgetop, north-facing slope stands between 7,000 and 7,500 feet in elevation.

On areas disturbed by fire, pinyon-juniper is confined primarily to rocky ridges and slopes. On areas relatively undisturbed by fire, pinyon-juniper extends into flatter areas with deeper soils. Dense stands on slopes of less than 20 percent could be most affected by intensive grazing management.

From a forage production standpoint, 43 percent of the pinyon-juniper woodland is in poor condition, 50 percent is in fair condition and 7 percent is in good condition. Less than one percent is improving while 21 percent is declining.

Forage production varies with pinyon-juniper density and can range from virtually no understory production up to 300 lbs/acre in good condition stands. Vegetation manipulation can increase productivity to 1,200 lbs/acre. The dense stands of pinyon-juniper are typically in static or declining condition with low productivity of forage due primarily to age and overstocking of the pinyon-juniper trees.

Of all the pinyon-juniper type in the planning area, approximately 78,570 acres considered to be productive areas for forest products (USDI 1981). Generally, a productive stand must have a crown canopy closure of at least 40 percent, existing or potential wood volumes sufficient for commercial interest, and be located on slopes gentle enough for commercial operations, usually less than 25 percent.

Saltbush Type

The saltbush vegetation type, covering approximately 0.5 percent of the planning area, is located in the area north of Calamity Ridge and south of the White River and consists of mixed saltbush and sagebrush stands. Dominant shrubs include Gardner's saltbush, mat saltbush, shadescale, bud sagebrush, big sagebrush and winterfat. Associated species are bottlebrush squirreltail, western wheatgrass, Colorado wildrye and cheatgrass. The saltbush association occurs below 6,000 feet and is found on lower elevation foothill slopes, semi-arid drainage bottoms, and alluvial deposits. Saltbush occupies heavy, fine textured soils that are less saline-alkaline than are normally found supporting greasewood. Saltbush communities are characterized by low growing, widely spaced plants, varying in species composition and density. These communities range from pure stands of an individual saltbush species to intermixed communities of many species.

All of the saltbush type in the planning area (3,343 acres) is in fair condition and trend is static.

Overall cover in the saltbush type averages 25 percent, with the shrub component making up most of the cover percent. Productivity is presently below potential, but based on Soil Conservation Service data, productivity could range from 50 lbs/acre on poor condition range to 350 lbs/acre on good condition range.

Greasewood Type

The greasewood type covers approximately 2,098 acres and is most prevalent on deep, poorly drained, alluvial saline-alkaline soils at elevations below 6,600 feet. Greasewood occurs both in dense and open stands with varying amounts of understory vegetation. Major associated species are big sagebrush, shadscale, rubber rabbitbrush, western wheatgrass, cheatgrass, mustard and Russian thistle.

Ninety-seven percent of the type is in poor condition with the remaining three percent in fair condition. Declining trend characterizes 16 percent of the type. Static trend dominates the remaining 84 percent of the type.

Cover in the greasewood type is dominated by greasewood. Very dense stands can have a nearly closed canopy with little understory vegetation cover while more open stands support more diverse understory cover. The average cover of greasewood and associated shrubs and grasses is 28 percent.

Productivity in the greasewood stand varies with greasewood density, ranging from 400 to 700 lbs/acre.

Broadleaf Type

Quaking aspen is the major species associated with this type which covers 7,312 acres. It is restricted to elevations above 7,000 feet with the majority of the trees occurring above 8,000 feet. Various willows and cottonwoods form another type but are very limited on public lands. They usually occur in drainage bottoms and along perennial streams. At lower elevations, aspen occurs in the upper end of drainages but occurs over wider expanses at higher elevations. The understory plant community includes bluegrasses, needlegrasses, snowberry, yarrow and lupine. The majority of the type is in a fair and stable condition with productivity similar to that of the mountain shrub type. This type is not considered important for forest products.

Conifer Type

The conifer type, occurs above 6,000 feet. It is a broad classification that covers several types. The major species is Douglas fir with very small acreages of blue spruce, Engelmann spruce, subalpine fir, ponderosa pine and lodgepole pine. The major concentrations of conifers occur along upper elevation drainages on northern exposures. Major understory species include snowberry, elksedge, and meadow rue, however, very few conifer stands support significant understory production.

From a forest product stand point, Douglas fir is the most important coniferous type. It is found primarily on the rim of the Piceance Basin, between 7,500 feet and 9,000 feet in elevation. Stands occur only on north-facing slopes and in protected coves in the lower elevations of the range. It will be found on additional aspects and on all protected sites (at the higher elevations). Most of these sites are on slopes greater than 25 percent. Most stands consist of mature and overmature trees, due to their unmanaged status. Douglas fir stands comprise 11,490 acres in the planning area (USDI 1981). In some areas, especially the southeast part of the Basin, there exists a serious infestation of the Douglas fir beetle in many stands of Douglas fir. This infestation has resulted in many dead trees in a significant portion of some stands, and further results in many blow-downs, injuries to residual trees and advanced regeneration, spread of the insects to healthy trees, and an overall major reduction of stand condition.

Barren and Waste Lands

Barren lands are those areas such as barren rock, erosion pavements, or rock outcrops having no significant amount of vegetation. Waste lands are areas which are too steep and/or rocky to be beneficial to livestock or big game. These areas include mostly steep inclines such as cliffs and rockslides. These two land categories are found throughout the planning area.

Riparian Zones

The riparian vegetation of the planning area is generally associated with small perennial streams, man-made reservoirs and stock ponds holding year-round waters, and spring sources. Riparian plant communities or zones are narrow bands that follow stream courses, and are very distinct from adjacent rangeland plant communities. Sizes of riparian zones generally accomodate the stream size, and are often limited by the steep banks of eroded gullies in which many stream beds are located. Narrow zones, one to five feet across, are typical at higher elevations and spread out gradually to as much as 50 to 75 feet in lower elevations. These communities are important because they support higher population densities and greater diversities of both plant and animal species than any other rangeland plant community.

Approximately 109 acres of riparian vegetation have been identified in 25 locations within the planning area. The following acreage classifications indicate the overall condition and trend ratings for the planning area:

fair/stable -- 63 acres
fair/declining -- 18 acres

poor/stable -- 23 acres
poor/declining -- 5 acres

THREATENED/ENDANGERED, RARE AND SENSITIVE PLANT SPECIES

At least ten sensitive plant species are known to occur within the Piceance Basin. To date, no Federally listed threatened or endangered species have been recorded within the study area.

The Piceance Basin is an ecologically unique area that harbors many unique plant communities. Some of these communities support rare and sensitive plant species that are restricted to areas of specific geologic formations and aspects. These rare and sensitive plants are generally associated with the Green River formation (Cashion and Donnell 1974) except *Festuca dasyclada* and *Astragalus lutosus* which also occurs in the Uinta Formation.

The habitat for many of the sensitive plant species usually consists of relatively steep slopes of poorly developed shalely silt loam soils or bedrock. However, *Festuca dasyclada*, *Aquilegia barnebyi* and *Sullivantia purpusii* are found in moist narrow draws and waterfall areas. *Astragalus detritalis* is associated with big sage and juniper and old alluvial terraces containing cobble sized stones. The large vertical exposures of the Green River Formation which outcrop along Cathedral Bluffs and at the mouth of Yellow Creek harbor the major concentrations of these sensitive plant species.

The status of rare and sensitive plants occurring in the Piceance Basin are listed in Table II-15. *Thalictrum heliophilum* and *Festuca dasyclada* are the only Category 2 plants in the Piceance Basin which the U.S. Fish and Wildlife Service (USFWS) are presently considering for possible Federal listing as threatened or endangered (England 1983). *Sullivantia purpusii* is rare (category 3C) but it is not actually threatened at the present time. If development does occur in the future and the habitat becomes threatened the status can be updated. The USFWS has not listed *Gilia stenothyrsa*, and *Gentianella tortuosa*, since it is locally abundant in Utah, although it is rare in Colorado.

The Piceance Basin was inventoried during the 1982 field season by the Nature Conservancy (TNC 1982) and data was collected on rare and sensitive plant species occurrences. The description of these plants, their distribution, phenology, habitat and environmental setting are described in the *Inventory of the Piceance Basin, Colorado Threatened and Endangered Plants, Plant Associations and the General Flora* (TNC 1982).

These rare and sensitive plants are not protected under the Endangered Species Act of 1973. Protection of rare and sensitive plant habitat is primarily through avoidance of surface disturbing activities on known locations as identified in the White River Resource Area Management Framework Plan.

TABLE II-15
STATUS OF RARE AND SENSITIVE PLANT SPECIES THAT OCCUR IN THE PICEANCE BASIN

Plant Name	USFWS Category Status 2/	Status in BLM Policy 5/
Aguilegia barnebyi	2	Sensitive
Astragalus detritalis	3C	Special Concern
Astragalus lutosus	2	Sensitive
Festuca dasyclada	2	Sensitive
Gentianella tortuosa	- 3/	Special Concern 6/
Gilia stenothyrsa	- 3/	Special Concern
Lesquerella #1 1/	-	Special Concern
Penstemon #1 1/	-	Special Concern
Physaria #1 1/	-	Sensitive
Sullivantia purpusii	3C	Special Concern
Thalictrum heliophilum	2 4/	Sensitive 6/

1/ The #1 is utilized because the material collected is currently being decribed as a new taxon.

2/ Status as adopted by the USFWS, December 15, 1980, Federal Register Volume 45, No. 242.

3/ No present U.S. Fish and Wildlife Service category status, because these species are more locally abundant in other states. These plants are regionally endemic.

4/ Presently being considered by the U.S. Fish and Wildlife Service, Region 6, for Category 2 status.

5/ BLM Policy from Colorado Instruction Memo #81-291, August 14, 1981.

6/ These species are not listed in the Colorado Instruction Memo #81-291, August 14, 1981, but fulfill the definition requirements of plant species of Special Concern and Sensitive plants as described in this memo.

10. WILDLIFE

INTRODUCTION

Approximately 365 wildlife species have been recorded or are speculated to inhabit the Piceance Basin either as residents or on a migratory basis. This includes 78 mammals, 255 birds, 15 fish, 12 reptiles and 5 amphibians. Only those species that may be significantly impacted or are of major concern are discussed in detail below.

TERRESTRIAL

Big Game

The Piceance Basin mule deer herd is considered to be the largest migratory herd in North America. Populations have fluctuated significantly since the 1950's (15,500 to 70,000) due mainly to severe winters, condition of winter range, and habitat destruction. The herd population is presently increasing since the massive die-off experienced during the winter of 1978 to 1979. The Colorado Division of Wildlife (CDOW) 1981-1982 winter deer population estimate was 28,000. Browse condition on winter range is generally poor, but has improved slightly over the last five years due to the lowered deer population and a corresponding reduction in winter forage use.

Winter range consists of pinyon-juniper and sagebrush vegetation types below 7,400 feet in elevation. Mountain shrub, aspen and Douglas fir types above 7,800 feet in elevation comprise the summer range.

A majority of the deer that winter in the planning area summer on the Flat Tops and Roan Plateau. Fall migration begins during the first two weeks of October with most deer arriving on the winter range by the end of October (Garrott and White 1982). Deer remain on the winter range until spring migration begins in mid-April with most deer arriving back on the summer range during May (Garrott and White 1982). Some mid-winter movement within the Basin occurs when deer move onto areas with south facing slopes. Mule deer seasonal ranges and migration routes are shown on Figure II-12.

The elk herd in the Piceance Basin has exhibited a significant increase in population size and occupied range during the last 20 years. The 1982-1983 CDOW population estimate indicates that approximately 1,200 elk inhabit the planning area on a year-round basis. Preferred summer ranges are typically above 7,800 feet in elevation in aspen, mountain shrub and Douglas fir vegetation types. Elk seasonal ranges and migration routes are shown on Figure II-13.

Mountain lions are distributed throughout the entire Basin perferring areas of dense mountain shrub or pinyon-juniper cover on rocky, rugged terrain. Lions are currently exhibiting a downward population trend with a population estimate of 15 for the area.

FIGURE II-12
MULE DEER SEASONAL RANGES AND MIGRATION ROUTES

A figure will be generated from the MOSS data base identifying all mule deer seasonal ranges and migration routes in the planning area.

FIGURE II-13
ELK SEASONAL RANGES AND MIGRATION ROUTES

A figure will be generated from the MOSS data base identifying all elk seasonal ranges and migration routes in the planning area.

Preferred black bear habitat of adequate quality is scarce in the Basin. An estimated 10 to 20 bears inhabit the Roan Plateau and Cathedral Bluffs with population trends presently stable.

Small Game and Furbearers

The cottontail rabbit is the dominant small game mammal in the Basin and inhabits all vegetation types with highest population densities occurring in greasewood-sagebrush draws. The coyote and bobcat are the most important furbearers based on harvest, monetary value and recreational days provided.

Game Birds and Waterfowl

Specific habitat designations and population data for sage grouse in the Piceance Basin are summarized in Krager (1977). Sagebrush density and height are important vegetation factors that influence sage grouse use of an area and habitat quality. Sage grouse winter at lower elevation ranges within the Basin and migrate to upper elevations of the Roan Plateau and Cathedral Bluffs for the summer. Sage grouse assemble in flocks on strutting grounds during the March 1 to May 15 breeding season for courtship and mating.

Blue grouse distribution is associated with the occurrence of Douglas fir, the dominant food source during the winter. Summer to early fall habitats are typically in open or semi-open areas along edges of mountain shrub and aspen types where herbaceous vegetation and insects are abundant.

The highest quality waterfowl habitat is associated with wetland habitat along the White River and at Rio Blanco Lake. Secondary use areas are on smaller perennial streams (e.g., Piceance Creek and Black Sulphur Creek) and ponds one-tenth of an acre or larger. Resident and summer breeding populations are low with greatest abundance present during spring and fall migrations.

Raptors

Twenty-two species of raptors have been recorded and range from uncommon to common in relative abundance. Approximately 135 nests have been identified in the Basin. Preferred habitats are best described by separating raptors into family units: accipiters, buteos, eagles, falcons, owls and harriers. Accipiters inhabit woodlands of pinyon-juniper and Douglas fir. Buteos, eagles and falcons prefer habitat of precipitous cliffs surrounded by open hunting areas of sagebrush, greasewood or sparse stands of pinyon-juniper. Owls are widespread, living in a variety of habitats. Harriers frequent open grasslands usually in proximity to marsh or wetland habitats.

Nongame - Birds, Mammals, Reptiles and Amphibians

A large number and variety of nongame species utilize the various habitats of the Basin. These are important prey species and may also be used as environmental quality indicators. No known populations or potential habitat for migratory birds of high Federal interest occur in the Basin. Information previously collected through field observations and literature reviews for nongame species is summarized in the Management Framework Plan (USDI, BLM 1981).

AQUATIC

Most aquatic environments are characterized as small headwater streams, one to five feet in width, less than two feet in depth, and with flow rates generally less than 0.5 cubic feet per second. Many stream beds lie in highly eroded gullies that flow through sagebrush or greasewood bottomlands.

Fish

The U.S. Fish and Wildlife Service (USFWS) and Colorado Division of Wildlife have classified all streams within the affected area as limited game fisheries potential of low resource value. The White River between Meeker and Rio Blanco Lake is classified as a limited game fishery, whereas the White River downstream from Rio Blanco Lake is classified as a limited game fishery and an endangered species fishery.

Lower elevational drainages in the area are dominated by species from the families Catastomidae (suckers) and Cyprinidae (minnows). BLM and Colorado Division of Wildlife surveys found segments of eight streams located on public land that supported game fish population (Table II-16). Most of these streams are located at higher elevations and support only marginal populations of small fish due to the small size and flow regimes of these drainages.

THREATENED AND ENDANGERED WILDLIFE SPECIES

Six Federally listed species were submitted by the USFWS for analysis in the biological assessment: the bald eagle, peregrine falcon, whooping crane, black-footed ferret, Colorado River squawfish and humpback chub. In addition, the greater sandhill crane and Colorado River cutthroat trout, two state listed endangered species, will be addressed. No critical habitat has been identified for Federally listed species in the Basin.

Bald eagles reside in the White River valley from October through March as winter residents and migrants. Core populations in winter vary from 50 to 70 birds, with migratory peaks of up to 160 birds in March. Bald eagles roost in cottonwood stands and Douglas fir stands along the White River and forage in upland areas. Foraging eagles are evident throughout Piceance Basin during the winter months, but no high use or preferred areas have been defined.

Peregrine falcons have been noted on several occasions in or near Piceance Basin. Lack of adequate nesting cliffs and suitable foraging habitat within the Basin's interior severely limits the possibility that suitable habitat exists. Sightings are likely a factor of migratory movement and post-breeding dispersal.

Recent reports of whooping crane in this region are attributed to the USFWS foster parent recovery program, since all observations have involved the

TABLE II-16
GAME FISH HABITAT

Stream Name	BLM Stream Miles	Total Stream Miles	Game Fish Present
Piceance Creek	4.5	42.5	Rainbow Trout, Brook Trout
Trappers Creek	6.0	7.0	Cutthrout Trout
Willow Creek	1.0	9.0	Rainbow Trout, Brook Trout
Middle Fork Stewart Creek	5.0	7.0	Rainbow Trout, Brook Trout
Fawn Creek	4.0	7.5	Rainbow Trout
West Fawn Creek	3.5	7.5	Rainbow Trout
Black Sulfur Creek	11.5	19.0	Rainbow Trout
White River	2.1	70.3	Rainbow Trout, Brown Trout, Mountain Whitefish, Channel Catfish, Black Bullhead

accompaniment of greater sandhill cranes. Whooping and sandhill crane use of Piceance Basin is considered incidental migration-related stopover because, 1) preferred crane habitat is severely limited in extent and quality in Piceance Basin, 2) all sightings are made concurrently with seasons of migratory movement, and 3) observations involve cranes in flight or ground use of short duration.

No recent or historic evidence exists which indicates occupation of the Basin by black-footed ferrets. In this region, white-tailed prairie dogs are considered to be their primary prey and known ferret distribution closely coincides with that of prairie dog towns. Gilbert (1976) identified three towns, totaling 121 acres in the northwest corner of the Basin along Highway 64.

It has been regularly documented that Colorado River squawfish occur in the White River. The Colorado segment of the White River is considered habitat for juvenile and adult squawfish. Apparent importance of the White River to fish in the Upper Colorado River Basin is quantity and periodicity of water flow.

There is one report of a humpback chub from the White River (Sigler and Miller 1963). However, the Colorado River Fishes Investigation Team, established in April 1979, have not found recent evidence of this species inhabiting the White River.

Trappers Creek supports a viable population of Colorado River cutthroat trout and is considered essential habitat by the Division of Wildlife. Behnke (1976) analyzed samples from this creek and identified them to be relatively pure specimens. Resampling in 1981 revealed some hybrid influence with rainbow trout and were assigned a purity grade of C which indicates that they are a good representation of Colorado River cutthroat stock, but exhibit some evidence of hybridization.

Federal and State regulations require management of areas inhabited by threatened or endangered wildlife species. This management may limit or constrain development of other resources. Projects with the potential for impacting water quality or quantity of the White River and Trapper Creek may be restricted. Restrictions would also be enforced on any project along the White River that would adversely impact bald eagle habitat or bald eagle use of this habitat.

IMPORTANT HABITAT FEATURES

Water is an essential habitat feature for wildlife due to its limited availability and distribution in this arid region.

Table II-17 summarizes important habitat features for wildlife species of primary concern.

11. WILD HORSES

The wild horse range in the planning area encompasses 249,183 acres in the northwestern portion of the Piceance Basin. The 1983 wild horse population is estimated to be 274 head.

TABLE II-17
IMPORTANT HABITAT FEATURES

Species	Habitat Features
Mule deer	Severe Winter Range Winter Concentration Areas
Elk	Summer Range
Mountain lion	Winter Concentration Areas
Sage Grouse	Winter Range Brood Habitat Strutting Grounds (Leks) Nesting Habitat ($\leq$ 2 mile from lek)
Raptors	Nesting Habitat (includes nest sites and feeding areas)
Colorado River Squawfish, Humpback Chub	White River
Bald Eagles	Wintering Areas Concentration Areas
Colorado River Cutthroat Trout	Trappers Creek
All	Water

Interviews with local residents of the Meeker area indicate that wild horse herds were here when the first settlers arrived in 1882. Many early ranchers released high quality studs into the wild herds that roamed the area. This practice was intended to upgrade wild horses for use in ranch work and for market. During the depression years, many small ranches and homesteads were abandoned. Domestic horses that were left behind were absorbed into wild horse herds, increasing their number and adding new genetic material to the wild horse population.

The Piceance Basin wild horse herd was initially counted in August 1975 and numbered approximately 143 head. The current population of 274 is based on a February 1981 aerial count with a 15 percent adjustment for the annual population increase. These horses are distributed in ten livestock allotments within the planning area.

Movement of wild horses within their range is influenced greatly by existing fences. Although horses have become accustomed to the fences, the fences remain a barrier to their free-roaming nature. Wild horses move between allotments that do not have complete boundary fences. Horse migration over the Cathedral Bluffs has been observed, allowing for the possibility of breeding between the Douglas Creek herd and the Piceance Basin herd.

Seasonal factors also influence horse movement and areas of concentration within the wild horse range. During periods of deep snow cover, horses concentrate on windswept ridges and southern exposures where forage is more readily available. During summer and early fall, wild horses are forced to concentrate around perennial water sources as intermittent waters dry up. The most important water sources in the Piceance Basin wild horse range are Yellow Creek, Stake Springs, Boxelder Creek, Corral Gulch, Duck Creek and Spring Creek. There are also approximately 19 developed springs, 10 undeveloped springs and 37 reservoirs in the horse range.

Wild horses compete with livestock, elk and a large herd of mule deer for forage. In addition, disturbances associated with natural gas and oil shale development have rapidly increased within the wild horse range within the past few years. Increased energy development and the increased forage requirements for wild horses have resulted in an expansion of the wild horse range. Presently, wild horses occur in areas beyond the recognized wild horse range (those areas utilized by wild horses at the passage of the Wild and Free-Roaming Horse and Burro Act of 1971).

12. CULTURAL RESOURCES

The cultural resources in the planning area represent a full chronology of habitation dates in surface as well as subsurface deposits. This is beneficial when using data accumulated to reconstruct prehistoric and historic lifeways. Cultural resources must be evaluated in terms of their potential to contribute information to a large data base and, thus, prove useful in answering research questions designed to explain the origins and history of man in northwestern Colorado.

To date, approximately ______ acres or _____ percent of the planning area has been inventoried at the Class III level for cultural resources. Based on a ratio of one site per _______ acres (BLM survey data on file in the White River Resource Area office), there could be approximately ___ sites in the Piceance Basin Planning Area. The cultural resource inventory has been stimulated by the intensive energy-related activity in the planning area. Consequently, most survey work has been done on a project specific basis and not as a result of a scientific research design. The exception to this is the survey work which was done by Gilbert/Commonwealth (Newkirk and Roper 1983) to field test their predictive model. The sampling design which was used to test the model is a stratified proportional random sample, with sampling strata defined by major drainage systems. No additional inventory was done for the preparation of this RMP. All data was taken from previous work done mostly in a support capacity for energy development and range improvement projects.

Table II-18 summarizes the types of cultural sites that are found in northwest Colorado and which may occur in the planning area.

Similar kinds of sites from the same general time period are given a type name and are assigned to a named tradition. In northwestern Colorado, the most common traditions are the Llano, Plano, Archaic, Fremont, Protohistoric and Historic (see Table II-19).

PREHISTORIC

Northwestern Colorado has been occupied by humans for at least 11,000 years. While the humans remained very similar physically, their environment and food sources changed slowly through time, bringing about changes in the behavior of the people involved. These changes were reflected in the debris which they left behind and which has been preserved through time. From this patterned, as opposed to random, distribution and its changes through time, a shadowy and incomplete picture of these people's lifeway can be built up. Data can be retrieved on what natural resources were available and utilized, how many people utilized them, and how they were used. Some data may be gained through archaeological research on what distributions and ranges certain animals and plants had in the past and what the past climate was like for comparison with current data.

The Gilbert/Commonwealth predictive model for the Piceance Basin (Newkirk and Roper 1983) was generated from data that resulted from the location of 380 sites and isolated finds which were recorded during six major surveys conducted between 1973 and 1980 (Gordon and Kranzush 1978, Grand River Institute 1980, Jennings and Spitzer 1976, Weber et al 1977, Price 1978, and Hurlbett 1976). The predictive model was originally intended to provide cultural resource data for the prototype oil shale planning effort. Therefore, only the area which was being analyzed for additional oil shale tracts was considered in the modeling process. The model is not suitable for application on a planning area-wide basis. It will, however, be utilized during the site-specific analysis after oil shale tracts are delineated. The model is suitable for prehistoric sites only.

Based on the portion of the planning area which was used as the study area for model generation, it was concluded that the following relations exist between site densities and environmental zones:

TABLE II-18
CULTURAL RESOURCE SITE TYPES

Function/Kind	Characteristics	Traditions
Lithic scatter (open lithic; chippings; chipping station)	Areas where the waste from the manufacture of stone tools or the tools themselves are found.	All
Campsite (habitation; camp; burnt spots; fire pots; hearths)	A lithic scatter with the addition of features connected with fire making; charcoal, ash fire cracked artifacts, fire cracked rocks, or burnt bone, groundstone and/or pottery.	All
Quarry (chippings; manufacturing areas)	An area containing a natural source of rocks suitable for making tools. Unmodified rock, waste, and tools in all stages of manufacture are found.	All
Kill site (trap; jump)	An area containing stone and/or bone tools in association with the remains of one or more animals.	All, but particularly Llano and Plano
Rock shelter (cave; overhang)	An area protected from the weather by an overhanging rock formation. Usually has a drip line. May or may not have surface material culture.	Plano, Archaic, Fremont, Protohistoric
Rock art (petrograph) (a) pictograph (b) petroglyph	Any artistic expression or message on a rock surface. (a) Painted figures of people, animals, plants, letters, numbers or abstracts. (b) Incised figures of people, animals, plants, letters, numbers, or abstracts.	Possibly Archaic, Fremont, Protohistoric, Historic
Burial	Remains of human beings, fragmentary or whole.	Fremont, Protohistoric/ Historic
Tipi rings (stone rings, tipis)	Circular arrangement of spaced rocks, 3 to 15 m in diameter.	Protohistoric/Historic
Wickiups (tipi poles)	Poles or branches of pinyon or juniper laid up against living trees Interior floored with juniper bark.	Protohistoric/Historic
Granary (cist, corn crib)	Mud-mortared sandstone slab structures, usually about 1.5 X 1.5 X 1.5 m. Most often built into sandstone ledges, sometimes mud lined and capped or lidded with a large slab.	Fremont
Rock walls (forts)	Alignments or walls of mud-mortared or dry-laid stone masonry. May be single or multiple. May have "doorway", usually build on ridge.	Fremont

TABLE II-18
CULTURAL RESOURCE SITE TYPES

Function/Kind	Characteristics	Traditions
Corrals/horse traps	Enclosure, usually of log or wood construction, with a single entrance. May have "wings" built onto entrance.	Protohistoric/Historic
Sweat Lodge	Conical shaped free standing structure of brush and poles with a large pile of fire-cracked rock immediately in front of opening to structure.	Protohistoric
Homestead	One or more structures of varied size, shape and materials used to shelter isolated Euro-American families claiming land under various homestead laws.	Historic

TABLE II-19
CULTURAL TRADITIONS

Time	Tradition
1776-50 years ago	Historic; Ute
c. 1250-1776	Protohistoric
c. 900-1250	Fremont
c. 2500 BC-AD 900	Archaic
c. 7000 BC-2500 BC	Plano
c. 10000 BC-7000 BC	Llano

1) Topographic zone, i.e. ridgetop vs. valley bottom is not an important predictor of site location.

2) Stream rank is a predictor; specifically, site density tends to be higher further up stream rather than along major streams.

3) Vegetation zone is also predictive. Site density appears higher in the pinyon-juniper and rabbitbrush-sagebrush zones.

4) Relief is also predictive; sites more frequently occur where relief is relatively low.

5) Exposure is predictive; sites with southerly exposures are most likely to occur.

6) Soil is not a particularly useful variable. That sites occur mostly on only a few soil types is probably more reflective of the correlations between soil types and vegetation than of selection for soils.

These factors are expected to be similar in other parts of the planning area but, to date, no work has been done to corroborate this theory.

HISTORIC

The Piceance Basin's history has been described in An Isolated Empire: A History of Northwestern Colorado (Athearn 1981), which is a Class I (literature search) inventory for the Craig District. Additionally, a supplemental Class I (History) inventory was prepared (Baldwin 1981), in which site summaries are provided to enhance the Class I narrative. These documents, along with Class III inventory, represent the present extent of inventory for historic sites in the planning area.

The first record of Europeans in this region dates from 1776 when the famous Dominguez-Escalante expedition passed along Douglas Creek on its way into Utah. From then until 1879, there was little interest in the Piceance Basin which was inhabited by Ute natives. In September 1879, Utes from the White River Reservation rose in rebellion, killing agent Nathan Meeker, and subsequently ambushing a rescue force commanded by Thomas T. Thornburgh. The result was that the Utes were forcibly removed from western Colorado and this portion of the state was opened to settlement.

The Piceance Basin was, at first, used for homesteading and livestock grazing. Since the land was broken and not well suited to agricultural uses, except along the bottomlands, cattle grazing and later sheepherding became the primary economy of the basin. This remains the case today. Physical evidence of these events includes log cabins, homesteads, ranches, corrals, cemetaries, school houses and other historic features. Additionally, horse traps are frequently found, indicating that wild horses were rounded up on a regular basis. Building types vary from large log cabins/houses to dugouts. Other settlement indicators include townsites like White River City. These manifestations of Euro-American development date from the late 19th century to about 1935.

The World War I era saw considerable development of oil shale in the Piceance Basin. This is reflected in what is thought to be an early oil shale retort and adit near Rio Blanco. This type of site dates from at least 1915 and there is a good chance that more historic oil shale processing sites may be identified.

Other physical evidence of Euro-American occupation includes the traces of a stage road from Rio Blanco to White River City, several survey cairns, sheep and cow campsites and one "religious" site attributed to local sheepherders. Thirty-four historic sites have been recorded to the present based on limited historic resource inventory conducted since 1972. Of these, 17 are located on BLM managed lands, 11 are on state lands, five are on private lands and one is on Department of Energy controlled land. The predominate site type in the planning area is cabins (17), followed by horse traps and corrals (8), with one each for all other types of sites except cemetaries and schools (2 each). This historic resource review indicates the range of sites and the settlement patterns throughout the Piceance Basin.

NATIONAL REGISTER

The Duck Creek Wickiup Village (5RB53) is the only cultural site within the planning area which is currently listed on the National Register of Historic Places. A fence was constructed in 1976 to protect the site from livestock damage and an interpretive sign was installed. At this time, no sites have been nominated or formally determined to be eligible to the National Register. Approximately ______ sites have been field evaluated as likely to be eligible but none of these assessments have been confirmed by the BLM.

LIMITING FACTORS

Mandatory protection of National Register sites requires Section 106 consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation to develop a suitable mitigation plan to ameliorate adverse impacts on listed or eligible sites. The consultation process could create a delay or necessitate relocation of proposed surface-disturbing projects. This would most likely affect energy development or range improvement projects. In most circumstances, avoidance of the site is the preferred mitigation method.

13. PALEONTOLOGICAL RESOURCES

A comprehensive paleontological inventory has not yet been completed in the planning area. However, several formations within the planning area, Morrison, Wasatch and Green River, have historically been known to contain significant fossils. Significant fossils are those which make a substantial contribution to scientific knowledge. In addition, site specific inventories have indicated the Williams Fork Formation of the Mesaverde Group may also yield significant vertebrate fossils, but further study is needed before the formation can be considered paleontologically significant. Table II-20 illustrates all of the fossiliferous formations of the planning area. For

TABLE II-20
FOSSILIFEROUS FORMATIONS IN THE STUDY REGION

ERA	PERIODS AND SYSTEM	EPOCHS AND SERIES	FORMATION		ENVIRONMENT	COMMON FOSSILS PRESENT
Cenozoic	Tertiary	Eocene	Bridger Formation		Fluvial	Vertebrate Fossils
			Green River Formation		Fluvial Lacustrine	Vertebrate Fossils Fossil Fish; Fossil Leaves & Insects. Fresh Water Gastropods and Pelecypods
		Paleocene and Eocene	Wasatch Formation		Fluvial and Lacustrine	Vertebrate Fossils, mammals Some Ostracodes and Gastropods. Fossil leaves, genus Aralia
		Paleocene	Fort Union Formation		Fluvial in Part of swamps and Marshes	Vertebrate fossils, fossil leaves
			Ohio Creek Formation		Fluvial	Non Fossiliferous
Mesozoic	Cretaceous	Upper Cretaceous	Lance Formation		Fluvial import swamp	Non Fossiliferous A few leaf fossils Vertebrate fossils
			Lewis Shale		Marine Off-shore	All Marine Fossils - Armonites, Pelecypods Crinoids, Gastropods.
			Mesaverde Group	Williams Fork Formation	Fluvial in Part Swamps Litteral Some Marine Shales	Fossil Plants from Genera Picus, Myrica, Eriocaulon, & Salix. Fossil leaves in coal. Ammonities & Inoceramus Clams in Marine Shales. Pelecypods, Gastropods
				Iles Formation	Fluvial in Part Swamps Litteral Some Marine Shales	Pelecypods, Fossil leaves in Steamboat Springs & in the coal Ammonities & Inoceramus Clams in Marine Shales-Fossil Plants of Genera Ficus & Halymenites.

TABLE II-20
FOSSILIFEROUS FORMATIONS IN THE STUDY REGION

ERA	PERIODS AND SYSTEM	EPOCHS AND SERIES	FORMATION	ENVIRONMENT	COMMON FOSSILS PRESENT
Mesozoic (cont)	Cretaceous (cont)	Upper Cretaceous (cont)	Mancos Shale	Marine Off-shore	Ammonites-Baculites Scaphites, Inoceramus Clams, Pelecypods, Cephalopods
			Frontier Sandstone	Marine Brackish Water	Pelecypods, Shark Teeth, and Plant Fossils
		Lower Cretaceous	Mowry Shale Member of Mancos	Marine Off-shore	Carbonized wood, Cyclord Fish Scales, Fish Bones
			Dakota Sandstone	Fluvial, Marshes and Swamps	Silicified Wood, Ferns Dinosaur, Mollusk
	Jurassic	Upper Jurassic	Morrison	Lake, Stream Floodplain & possibly delta deposits	Abundant dinosaur fossils
			Curtis		Marine Pelecypods, Gastropods and Cephalopods
			Entrada		Non fossiliferous
			Carmel		Fossils uncommon
		Middle Jurassic	Navajo	Eolian, basal layers waterlain	Dinosaur tracts
	Triassic	Upper Triassic Lower Triassic	Chinle		Silicified wood. Phytosaur teeth and bone fragments. Amphibian bones.
			Chinarump		Silicified wood common
			Moenkopi		Reptilian tracks

TABLE II-20

FOSSILIFEROUS FORMATIONS IN THE STUDY REGION

ERA	PERIODS AND SYSTEM	EPOCHS AND SERIES	FORMATION	ENVIRONMENT	COMMON FOSSILS PRESENT
Paleozoic			Park City		Gastropods & Pelecypods
			Weber		Unfossiliferous
			Morgan		Brachiopoids, Corals, Bryozoa & Forominifera
	Mississippian		Madison		Occassional fossiliferous layers. Corals Brachiopods and Trilobites.
			Lodore		Frequently fossilerous. Trilobites, Brachiopods and Gastropods

more detailed information concerning the formations the reader is referred to a study conducted by Spencer and Kihm entitled Paleontological Resources of Part of Piceance Creek Basin, Colorado (December 1982).

14. RECREATION

Hunting, primarily big game, is by far the dominant recreation activity occurring on the public lands in the Piceance Basin. Figure II-15 shows the location of the significant recreation resources related to hunting in the planning area. Camping occurs as a spinoff activity. It is estimated that there may be up to 20,000 camping days spent in the Basin during hunting season. Figure II-14 shows the concentration areas for camping although most is dispersed. The capability of these areas to provide recreation opportunities is also shown.

While no comprehensive visitor-use studies have been made for the Piceance Basin, secondary information relating to hunting does exist. This information is available from the Colorado Division of Wildlife's harvest data. While the Division's game management units do not correspond with the boundaries of the Piceance Basin Planning Area, it is possible to approximate recreation use information for the area. The Piceance Basin receives approximately 52 percent of the total hunting use that occurs within the White River Resource Area. This is predominately big game hunting with deer hunting by far the major recreation activity.

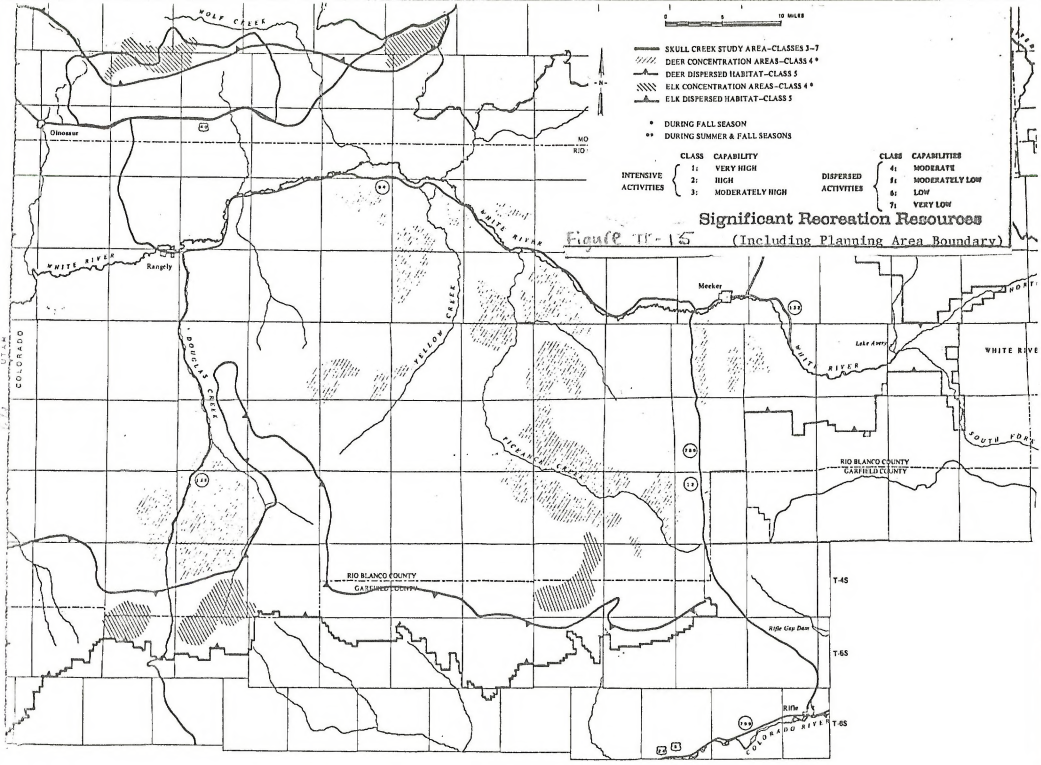
There are some 33,000 recreation days related to hunting that occur annually in the Piceance Basin. Of this, approximately 75 percent (25,000 recreation days) is big game hunting with the remainder (8,000 recreation days) small game hunting, primarily rabbit. Of the people who hunt annually in the Basin, 60 percent are mule deer hunters. The deer populations in the Basin are subject to cyclic variations due to severe winters; therefore the recreation opportunities correlate to these variations. (Note: The figures presented above depict an average year.)

Early hunting seasons such as archery and muzzle loading find most hunters on the White River National Forest to the east and the upper elevations in the southern part of the Basin. As the weather grows colder and the animals migrate down to BLM lands, the hunting use naturally follows. Elk hunting is predominantly associated with National Forest lands; however, the elk herds on BLM lands are steadily increasing. Elk hunting on BLM lands occurs in the southern most part of this planning area, along the Roan Divide and up Cathedral Bluffs. Mule deer and smaller game hunting occurs throughout the Basin.

Of the total number of big game hunters using public lands in the entire White River Resource Area, 30 percent are usually from out-of-state. California and Texas dominate the out-of-staters. Of the in-state hunters, 8 percent are local (Rio Blanco County), 42 percent are from the Denver metro area and 50 percent are from other areas in the state. The percentages for use occurring in the Piceance Basin vary from the remainder of the resource area, with over half of the big game hunters coming from out-of-state.

FIGURE II-14

Camping Concentration Areas Buffered Roads and Inventoried Primitive Sites



Significant Recreation Resources

Figure II-15 (Including Planning Area Boundary)

Outside of the hunting and camping activity, the public lands in the Piceance Basin generally add another dimension to recreation opportunities available on other public lands (e.g. National Forest lands) in the region by providing unrestricted settings for activities such as off-highway vehicle (OHV) use and wildlife viewing. OHV use occurs mostly as a means of transportation for other types of recreation, such as hunting and firewood gathering.

15. VISUAL RESOURCES

The Piceance Basin has a highly dissected landscape dominated by an interior plateau with relief diminishing from south to north. The vegetation is predominately pinyon-juniper (see Topography and Vegetation sections).

An inventory of the visual resources in the Basin was conducted in 1978. One of the elements evaluated was the overall scenic quality of the area. Scenic quality relates to the inherent scenic values of the landscape and can perhaps be best described as the overall impression retained after driving or walking through an area. The Basin was quantitatively rated on seven key factors: land form, vegetation, water, color, influence of adjacent scenery, scarcity and cultural modification. Ratings are based on relative comparision to similar landscapes of the Colorado Plateau physiographic province, an area which covers western Colorado, northwest New Mexico, northern Arizona, and the southeast half of Utah. The values for each category are calculated and, according to total points, three scenic quality classes are determined and mapped:

> Class A - Areas that combine the most outstanding characteristics of each rating factor.
>
> Class B - Areas in which there is a combination of some outstanding features and some that are fairly common to the physiographic region.
>
> Class C - Areas in which the features are fairly common to the physiographic region.

The acreage identified in each class is presented in Table II-21.

See Figure II-16 for the location of these classes in the planning area.

16. WILDERNESS

In Section 603 of the Federal Land Policy and Management Act (FLPMA) of 1976, BLM was directed to review all roadless areas of 5,000 acres or more for their wilderness potential. The process was initiated in 1978 with the wilderness inventory. This inventory, which was completed in November 1980, did not identify any Wilderness Study Areas (WSAs) in the Piceance Basin, so all public lands in the planning area have been released from further wilderness consideration under provisions of Section 603.

TABLE II-21
SCENIC QUALITY RATING
Piceance Basin Planning Area

Scenic Quality Class	Acres	Percentage of Planning Area
A		
B		
C		
Total	805,900	100.00

FIGURE II-16

Show Visual Resource Management Classes in the planning area.

No designated Wilderness Areas are located in or immediately adjacent to the planning area. The nearest designated Wilderness Area is the Flat Tops, located in the White River National Forest, 40 miles to the east of the planning area. The nearest administratively endorsed wilderness study area is Dinosaur National Monument, located 36 miles to the north of the planning area.

In addition, six BLM wilderness study areas were identified in the White River Resource Area. Of these, only one (Bull Canyon) was found to be suitable for wilderness designation (preliminary recommendation, November 1982).

Since there are no existing or potential wilderness areas within or immediately adjacent to the planning area, wilderness will not be discussed as a separate resource further in this plan. Air quality (including visibility and its relationship to existing wilderness areas in the region) is addressed in the Air Quality section.

17. SOCIAL

Few persons live in the Piceance Basin Planning Area - mostly ranch families scattered along its northern and eastern borders in the White River valley and the Highway 13 corridor. About a dozen ranches lie along Piceance Creek which cuts diagonally across the northeastern part and up two side valleys (some housing more than one family). A few ranches on the White River have been sold to energy companies and grazing rights leased by local ranchers.

Two other principal human activities occur in Piceance Basin itself: seasonal big game hunting, and oil shale and minerals mining.

Politically and socially, ranchers in this region of Colorado have traditionally held dominance beyond their proportionate numbers, a strength that has waned since the latest energy boom began in the 1970's.

Hunting, while seasonal, has long-time social importance, both as a source of valued recreation by local citizens, and as a source of economic benefits. At least some Meeker citizens apparently have chosen to live here because of the outstanding hunting and fishing opportunities. Local lifestyles depend to some extent upon Piceance Basin game.

Common in such settings are conflicts between hunters and ranchers because some hunters are careless of the property and stock of ranchers, and some ranchers restrict vehicle access. Likewise, hunters and ranchers are sometimes in conflict with mining interests while various mining and oil shale interests are negatively competitive with each other.

Of the communities near the boundaries of the planning area, Meeker, Rangely and Rifle are most likely to be socially affected by BLM decisions and actions. All communities mentioned in this discussion are shown in Figure II-2.

MEEKER

Meeker traditionally was a scenically located, small, isolated ranching community with a hunting-fishing tourist trade in fall and summer. But it, like Rifle, has lived in the shadow of energy development for 80 years. Only after 1975 did the activity seem certain enough to erode the skepticism of lost expectations from the past.

By about 1980, a general spirit of either resignation to, or active acceptance of, energy growth was beginning to prevail. Local and county governments were developing a more formal structure to provide for growth management. Professional planners were hired, and Oil Shale Trust Fund and other impact monies were obtained for expanding facilities and services.

An advisory group of local leaders, business, government, industry and human service representatives was formed. A new Human Resources Council coordinates social services planning, and identifies needs. A recreation survey was made, and a plan is being implemented.

Additional housing of various price ranges was built at a rapid pace; social services, such as mental health, aid for the handicapped, and a branch of Colorado Northwest Community College, were all being added or expanded. Some conflicts among interest groups and competition for funding have, of course, been inevitable.

Boom conditions have slowed, perhaps reversed, in Meeker since 1981. Leaders now have concern for surplus housing, unemployment, and other "bust" problems, at least for the short-term. While there is optimism that oil shale operations will resume at C-a and C-b tracts eventually, and that local coal markets will improve in a few years, prospects for immediate energy turnaround are dim, and Meeker faces at least some period of stability or decline.

A 1981-82 on-going study of social impacts to Meeker (Lilydahl et al 1982) indicates that the people continue to treasure their beautiful natural environment with its clean air and clean water. Further details on this longitudinal community-wide study are given in Appendix S.

Thus, Meeker was in a boom growth pattern for several years but is currently in a slump which, if it ends within a reasonable time (two or three years), will have given the community the breathing spell necessary to catch up sociologically with the changes that have occurred, and thus will have been beneficial.

RANGELY

Rangely is more isolated, less scenic, more arid, and has a very different historical setting than Meeker. Distance from other Colorado towns has caused it to orient more to the Vernal, Utah, area.

Rangely's population jumped from 100 or so to 5,000 during the oil and gas boom of World War II. Rangely is thus a younger town than Meeker. It has always been an energy town. The drier climate supports less ranching and little tourism, so its traditions did not grow out of the usual ranching society of northwest Colorado. It had previously struggled to retain its population, and both prepared for and welcomed energy development during the late 1970's when energy independence became a national priority.

Among Rangely's preparations for growth was the creation of a Recreation District that obtained financing for the most complete recreation facility in the region. Colorado Northwest Community College provides a technical program geared specifically to energy production and the hospital and schools have low occupancy rates so they can absorb considerable growth. Planning, zoning, and stipulations for front-end financing, of the Moon Lake Power Project (which includes the Deseret Power Plant 35 miles west of Rangely, in Bonanza, Utah, and the Western Fuels coal mine that will supply the power plant, just east of Rangely), have made possible further social and economic impact mitigations. Housing and lands available for development continue to be in short supply, but a recent purchase of land from BLM makes possible further expansion of the community.

The formalization of political, planning and other government processes has been occurring in Rangely for several years, through increasing use of professionally trained personnel. A diversification of the political base has also been taking place, as political power is gradually shifting away from the dominance of male ranchers who have been in the area for a long time, to include both newcomers and females in elected positions.

Oil shale projects in Piceance Basin had little social impact on Rangely because there was no good road, connecting Rangely to C-a Tract. A similar situation limits the number of Deseret Power Plant workers who might otherwise live there instead of in Jensen or Vernal, Utah.

Rangely has shared with Meeker the establishment of the countywide Advisory Group and the Human Resources Council. Some services formerly based in the county seat of Meeker now have branches in Rangely (for instance, the Mental Health Clinic). The two communities also share law enforcement.

The slump affecting Meeker and Rifle has not occurred in Rangely because it had fewer workers in oil shale, and also because of the influx of workers for construction of various portions of the Moon Lake Power Project.

No up-to-date attitude studies are available for Rangely, but there now apparently exists some concern about too rapid growth, a shift from the highly positive orientations and preparations which prevailed until very recently. Some tensions between temporary workers and the permanent local citizenry have resulted from a tendency to ignore the needs of the temporary workers.

RIFLE

Rifle was at the center of an "oil shale boom" at least twice before the present -- in 1913 and again in the late 1940's -- though in each instance the boom was more in expectations than in reality. The skepticism growing from those times made the community doubtful that oil shale would "go" in the 1970's and 1980's. Only recently did skepticism give way to belief -- just in time to be shattered by the slow-down of oil shale development in the region.

Rifle has prepared for growth by various funding methods. Boom conditions have existed since the late seventies as population increases began producing shortages and congestion as well as some better shopping facilities, and expansion and improvement of social services delivery systems such as mental health. A newcomer integration project, a branch of Colorado Mountain College and programs for the elderly are well under way. A $100 million Human Services building plan is going forward, in which space will be free to services providers.

Other responses to structural pressures have also occurred. Efforts to control downtown congestion on Railroad Avenue (Hwy. 13 north-south) caused some citizen/local government conflicts because of disagreements regarding a by-pass route. This by-pass, now completed, is just west of town. In the most recent local election (late 1981), three of five new council members were new residents, evidence that the political base is diversifying in Rifle. Rifle has more than tripled its population since 1972.

According to a recent BLM (1981) study based on a random sample of 109 persons, the people of Rifle favor energy development by a two-thirds majority, but not at the expense of a deteriorating environment. Old-timers felt the stresses of seeing their community become more congested and less psychologically comfortable, but in general they also saw some advantages such as better employment opportunities for the younger population. They were glad for better shopping facilities, and they believed the country needs the oil. Respondents in this study saw the biggest problems as rise in living costs, traffic congestion, higher crime rates, and housing shortages. Fifteen percent mentioned concern about the natural environment.

In-depth interviewees ranked wildlife as of highest priority among BLM responsibilities, with watershed second. The other four choices (range, timber, recreation, and energy and minerals) ranked about equally. Further details from this attitudinal study of Rifle are given in Appendix S.

BLM decisions and actions in this planning area, except for those associated with oil shale or other minerals, should have little measurable social impacts on other communities. If sizeable energy or minerals mining should occur, however, small communities near Rifle (Silt, New Castle, Parachute) would probably be affected to some minor degree. These, like Rifle, grew due to oil shale work on the Roan Plateau, and have shared in the general turmoil accompanying the Colony slowdown. They are, in general, prepared for further growth.

Sizeable oil shale or minerals development in this planning area would also bring at least some company white collar personnel and secondary workers to Grand Junction, which is, likewise, able to absorb more population.

8. ECONOMICS

IMPACTED AREA

Economic data is available only by county. Therefore, an impacted area for economic analysis has to be defined in terms of whole counties. The impacted area for this analysis consists of Garfield, Mesa and Rio Blanco Counties.

EMPLOYMENT AND INCOME

Employment and income figures are shown in Table II-22. The figures are by place of residence. For this reason they will differ from most other employment and income figures, which are by place of work and do not take commuting into account.

Both Garfield and Mesa Counties have diversified economies. Garfield County has an important tourist trade. Mesa County is a business and manufacturing center and has a large agricultural sector. Rio Blanco County, in contrast, has a major part of its present economy based on mineral development. Livestock production remains an important factor in all three counties, but has become small numerically compared to the other developments. Rio Blanco County also has a tourist trade, dominated by fall hunting and summer mountain recreation.

Figures for 1982 reflect the oil shale projects prior to their suspension. Present employment levels are lower, as is indicated by the sharply higher unemployment ratio in latter 1982.

POPULATION

Table II-23 shows 1980 populations.

Mention needs to be made of Census county divisions. In cooperation with local officials, the Census Bureau divides most counties into two or more parts. Maps of the county divisions can be found in Population Census reports. In the impacted area, most of which is sparsely populated, the great majority of a county division's population is located in or adjacent to its communities. For this reason, and because city boundaries can readily be changed, it is believed that county divisions make a better base for projections than present city limits. Therefore, all projections will be for county divisions and should be compared to the 1980 division populations.

Because Grand Junction has a metropolitan-type development, the Clifton and Grand Junction Divisions are used to represent that area.

Uneven population distribution characterizes the impacted area. The majority is located in the Grand Junction area of Mesa County. Garfield County's population is heavily concentrated in the central and eastern parts of the county. Settlement in Rio Blanco County is clustered around its two communities: Meeker and Rangely. Areas between these population nodes consist of sparsely settled ranching country and unpopulated national forest.

TABLE II-22
CURRENT EMPLOYMENT

	Employment			Percent of Total		
	1980	1981	1982	1980	1981	1982
Garfield County						
Agriculture	596	584	572	5.3	4.4	4.2
Mining	608	845	817	5.4	6.4	6.0
Construction	1,241	1,918	2,087	11.0	14.5	15.4
Manufacturing	213	280	291	1.9	2.1	2.2
Trans., Comm., Utilities	773	851	862	6.9	6.4	6.4
Trade	2,256	2,556	2,604	20.0	19.3	19.2
Finance, Ins., real est.	358	400	403	3.2	3.0	3.0
Services	1,780	1,977	2,006	15.8	14.9	14.8
Government	1,977	2,326	2,372	17.6	17.5	17.5
Unclassified	1,450	1,519	1,528	12.9	11.5	11.3
Total	11,253	13,260	13,547	100.0	100.0	100.0
Total labor income (000)	$146,847	$198,447	$200,570			
Percent unemployment	4.1	4.3	8.2*			
Mesa County						
Agriculture	1,896	1,858	1,821	5.2	4.9	4.7
Mining	2,044	2,010	1,926	5.6	5.3	5.0
Construction	2,733	3,152	3,207	7.5	8.2	8.3
Manufacturing	2,664	2,844	2,943	7.3	7.4	7.6
Trans., Comm., Utilities	2,421	2,497	2,520	6.6	6.5	6.5
Trade	8,269	8,728	8,849	22.6	22.8	23.0
Finance, Ins., real est.	1,325	1,379	1,390	3.6	3.6	3.6
Services	6,420	6,686	6,771	17.6	17.5	17.6
Government	5,076	5,431	5,469	13.9	14.2	14.2
Unclassified	3,676	3,678	3,638	10.1	9.6	9.5
Total	36,525	38,268	38,538	100.0	100.0	100.0
Total labor income (000)	$496,207	$534,211	$536,514			
Percent unemployment	3.5	3.6	6.6*			
Rio Blanco County						
Agriculture	290	283	277	6.1	5.4	5.0
Mining	1,563	1,726	1,624	32.7	32.8	29.2
Construction	1,097	1,211	1,445	22.9	23.0	26.0
Manufacturing	30	42	60	.6	.8	1.1
Trans., Comm., Utilities	180	194	203	3.8	3.8	3.6
Trade	375	424	475	7.8	8.1	8.6
Finance, Ins., real est.	24	32	39	.5	.6	.7
Services	160	197	237	3.3	3.8	4.3
Government	724	784	828	15.1	14.9	14.9
Unclassified	345	357	367	7.2	6.8	6.6
Total	4,788	5,255	5,558	100.0	100.0	100.0
Total labor income (000)	$92,557	$102,520	$109,119			
Percent unemployment	1.9	2.3	5.1*			

* September 1982

TABLE II-23
1980 POPULATION

	County	County Division	Community
Garfield County	22,514		
Glenwood Springs Division		12,394	
Carbondale			2,084
Glenwood Springs			4,637
Grand Valley Division		956	
Parachute			338
Battlement Mesa			0
New Castle Division		3,943	
New Castle			563
Silt			923
Rifle Division		5,221	
Rifle			3,215
Mesa County	81,530		
Collbran Division		1,862	
Collbran			344
DeBeque Division		449	
DeBeque			279
Fruita Division		8,892	
Fruita			2,810
Grand Junction Area *		67,894	
Grand Junction			28,144
Palisade			1,551
Other Divisions		2,433	
Rio Blanco County	6,255		
Meeker Division		3,642	
Meeker			2,356
Rangely Division		2,613	
Rangely			2,113

* Grand Junction and Clifton Divisions

HOUSING

Vacancy rates were less than 10 percent (indicative of a housing shortage) in five of the communities: New Castle, Silt, Fruita, Grand Junction and Rangely. Housing remains scarce and expensive in Rangely and Dinosaur because they are currently impacted by development associated with the Moon Lake Power Project. Conditions have become less stringent since 1980 in New Castle, Silt, Fruita and Grand Junction as reduced population growth has allowed construction to catch up with (and in some cases exceed) demand. Vacancy levels in Table II-24 should be treated with caution because the housing situation in many communities has changed in the ensuing three years and because they do not indicate either physical condition or whether they are year-round or seasonal units.

INDUSTRIES THAT MAY BE DIRECTLY IMPACTED

Livestock Grazing

Livestock production is the principal agricultural activity in the Piceance Basin Planning Area. Crop production is dominated by hay for livestock use. Estimated 1980 earnings from livestock and products in Rio Blanco County are $7,778,000, while crop production earnings total $914,000 (BEA 1982).

Irrigation is important to agriculture in the region's dry climate. Slightly over one-half of Rio Blanco County's harvested acreage in 1980 was irrigated, mostly hay. Some pasture is also irrigated, but the amount is not recorded (Colorado Department of Agriculture 1981).

Mining

Mining is the most important industry in Rio Blanco County, providing 29 percent of 1982 total employment and 87 percent of 1979 basic industry sales (estimated from McKean and Weber 1978). Oil and gas are the dominant products, accounting for 98 percent of the $420 million value of mineral production in 1980. Coal and oil shale provided most of the remainder (Colorado Division of Mines 1981). Oil shale production form pilot projects was included in the county's mining figures.

Recreation

Hunting is the most significant recreation activity in the Piceance Basin Planning Area. In 1981, an estimated total of 87,000 days were spent by non-resident hunters in Rio Blanco County. At an average of $6.62 per day in 1980 dollars (derived from McKean and Weber 1978), for non-resident hunters the economic value to the county was about $570,000. An estimated 16,000 non-resident hunter days, 18 percent of the county total, were spent in the Piceance Basin area. Hunting of deer and elk, the two most important game animals in the Piceance Basin, contributed some $100,000 or 18 percent, of the total value. No figure for economic value of resident hunters (3,500) was determined. Note: Hunting levels fluctuate greatly depending upon game populations. For instance, in 1979, hunting levels were some 73 percent higher.

TABLE II-24
1980 HOUSING UNITS

	Occupied	Vacant
Garfield County		
Carbondale	724	106
Glenwood Springs	1,930	230
New Castle	233	22
Parachute	129	15
Rifle	1,170	200
Silt	331	26
Mesa County		
Collbran	135	24
DeBeque	107	29
Fruita	947	78
Grand Junction	11,766	940
Palisade	585	72
Rio Blanco County		
Meeker	846	135
Rangely	684	59

LOCAL GOVERNMENT FINANCES

Area communities obtain most of their revenues locally. As shown in Table II-25, local sources account for 67 to 95 percent of total community revenues. This large dependence on local sources means that the communies can be highly impacted by developments that affect their tax base. Area school districts are less dependent on locally-generated revenues because of the state equalization formula (Table II-26). The only districts which obtain more than 70 percent of their funds locally are two that have high per capita assessed valuations from mineral development.

Rough measures of local funding sources are provided by per capita figures on assessed valuation and retail sales. They show that, in general, the larger communities have more substantial property tax bases, but that school district property tax bases and community sales tax bases vary according to individual circumstances. The sales tax aspect is important because those revenues account for up to 31 percent of total community revenues, with a median figure of 22 percent. Those communities having strong retail sales bases, generally because they are either business or tourist centers, will be in a better position to handle financial impacts.

At present, the communities' ability to increase these revenue sources is restricted. State law imposes a seven percent limit on annual increases in property tax revenues, and a four percent ceiling on combined municipal and county sales tax rates. Since only Rio Blanco County presently has a sizable sales tax, most of the communities have some leeway to raise revenues by that means. School district property tax revenues are controlled by the state equalization formula.

Figures on remaining bonding capacity in Tables II-25 and II-26 indicate two things: (1) how much major capital improvement could be funded from local resources and (2) the size of the existing debt burden. State law imposes the ceilings shown in the footnotes. All but three of the communities and all of the school districts have more than half of their bonding capacity still available for use. However, the amounts would still be insufficient to meet the needs of major growth. Conversely, since only one community (and no school districts) has a general obligation indebtedness exceeding $300 per capita, existing debt burdens should not become a problem.

19. NOISE

Existing noise levels in the Piceance Basin vary between 35 and 45 decibels (dB). Noise sources are primarily natural, such as wind, but additional noise comes from aircraft (50 dB) and traffic on nearby roads. The equivalent continuous noise level for Colorado Highway 64 is 66 dB, and for Colorado Highway 13 is 67 dB. Noise levels along Piceance Creek road would be similar. Noise levels at specific sites involving construction or operation of machinery can reach 65 dB to 75 dB. A level of 55 dB is considered by the Environmental Protection Agency to be the level above which annoyance occurs in a residential neighborhood. A similar threshold has not been established for rural areas.

TABLE II-25
COMMUNITY FINANCIAL DATA

	Carbondale	Glenwood Springs	New Castle	Parachute	Rifle	Silt	Collbran	DeBeque	Fruita	Grand Junction	Palisade	Meeker
Source of revenue (1980 %) 1/												
Local	92	95	93	87	94	75	91	87	90	93	95	67
State	5	3	6	11	3	20	6	9	5	4	3	30
Federal	3	2	1	2	3	5	3	4	5	3	2	3
Assessed valuation (1/1/82)												
Total (000)	$6,995	$23,895	$1,005	$685	$12,233	$1,514	$693	$588	$7,911	$128,649	$3,937	$7,008
Estimated per capita	2,200	3,140	1,250	730	2,570	1,170	1,960	1,100	2,720	2,600	2,160	2,690
Mill levy (1/1/82)	7.80	8.00	11.105	14.306	10.49	20.015	22.29	18.99	15.00	12.00	24.35	8.83
Retail sales (FY 1981)												
Total (000)	$16,955	$164,718	$2,052	$2,237	$55,155	$2,300	$1,959	$671	$17,596	$750,291	$6,700	$19,398
Estimated per capita	5,870	22,780	3,060	3,700	12,960	2,150	5,650	1,740	6,160	15,740	4,000	7,730
Sales tax rate (7/1/81 %)	3.0	2.0	2.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	1.0	3/
Bonded debt (12/31/80)												
General obligation (000)	$81	$2,070	$180	$0	$441	$71	$0	$0	$505	$5,800	$685	$0
Revenue (000)	1,397	415	0	0	374	0	0	95	51	8,655	320	1,347
Remaining bonding capacity (000) 2/	619	4/	0	68	4/	80	69	59	286	4/	0	701

1/ Figures include enterprise funds (water and sewer service, etc.) but exclude large one-time federal and state grants.
2/ Three percent of actual valuation less general obligation bonded debt.
3/ Receives county sales tax (2.0 percent) revenue collected within city limits.
4/ Home rule cities are exempt from bonding limit.

Source: Colorado Division of Local Government 1980 Local Government Financial Compendium, and files.
Colorado Division of Property Taxation, Eleventh Annual Report 1981.
Colorado Department of Revenue, Annual Report 1981.

TABLE II-26
SCHOOL DISTRICT FINANCIAL DATA

	Roaring Fork School District	Rifle School District	Grand Valley School District	DeBeque School District	Plateau Valley School District	Mesa Valley School District	Meeker School District	Rangely School District
Source of revenue (1980 %)								
Local	61	41	59	72	46	49	68	95
State	37	57	37	28	51	48	28	4
Federal	2	2	4	0	3	3	4	1
Assessed valuation (1/1/82)								
Total (000)	$60,557	$33,342	$5,928	$18,116	$10,499	$328,272	$34,006	$300,786
Estimated per capita	4,450	3,010	2,830	23,060	5,520	3,960	9,000	93,940
Mill levy (1/1/82)	47.12	45.71	53.87	25.94	41.47	47.44	51.08	9.19
Bonded debt (12/31/80) (000)	$3,470	$1,840	$46	$17	$0	$0	$830	$0
Remaining bonding capacity (000) 1/	8,641	4,828	1,140	3,606	2,100	65,654	5,971	60,157

1/ Twenty percent of assessed valuation less bonded debt.

Source: Colorado State Auditor, files.
Colorado Division of Property Taxation, Eleventh Annual Report 1981.
Briscoe, Maphis, Murray and Lamont, Chevron Shale Oil Company Clear Creek Project, Draft Socioeconomic Assessment, Existing Conditions Vol. 2.

20. TRANSPORTATION

PRIMARY ROADWAYS

Major highways and county roads which service the Piceance Basin are Colorado State Highway 13/789 which runs from Rifle to Meeker, Colorado State Highway 64 which runs from Rangely to Meeker, and Rio Blanco County Road 5 (also known as Piceance Creek Road) which forms a loop between Colorado 13 and Colorado 64. A 23.5 mile gravel surfaced county road is currently under construction between C-a Tract and Rangely. Figure II-17 shows the location of these roads.

Current highway use for the segments studied is well under capacity. Capacities for state highways are figured with an average travel speed of 50 miles per hour, and 40 miles per hour for county roads. Colorado 13/789 receives the most use, and also has the largest number of accidents. Table II-27 illustrates highway use, capacity and accident statistics.

An undetermined amount of pavement damage occurs on these road segments from current use. Presently, there is no large scale trucking of minerals to a point of destination. Most heavy truck traffic occurs from oil and gas, and construction activities.

SECONDARY ROADWAYS

Within the Piceance Basin is a network of over a thousand miles of secondary roads. These roads include county, BLM and oil and gas access roads. The majority of these roads are unimproved by asphalt or gravel surfacing. In many cases, the oil and gas roads must be considered temporary roads which are slated for possible reclamation. The number of oil and gas access roads changes on a monthly basis due to new wells being drilled, and due to roads being reclaimed after well abandonments.

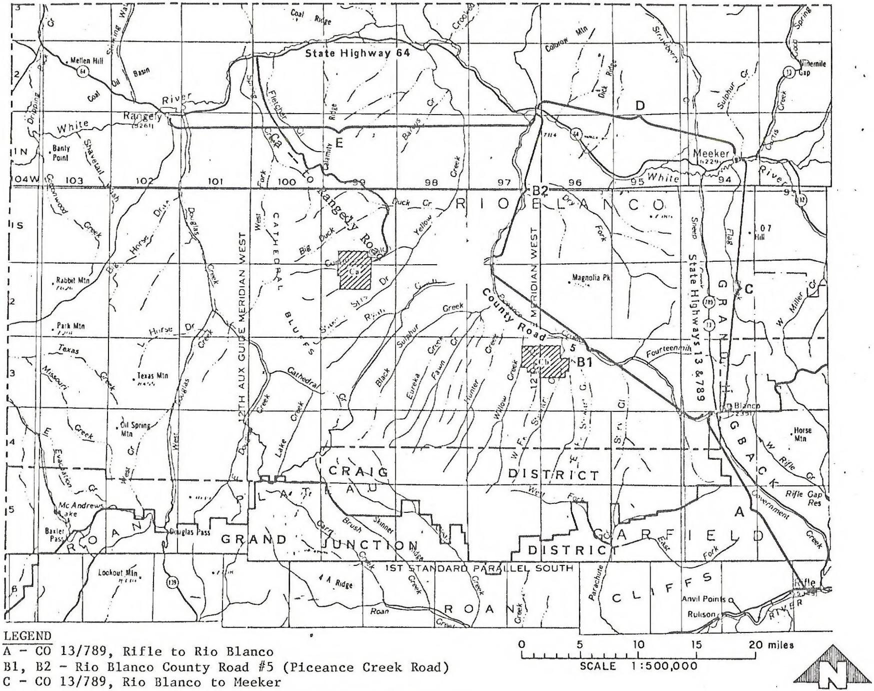
PIPELINES

The planning area has undergone extensive oil and gas development. This development includes the following:

-- A 14 inch transmission line owned by Mountain Fuel Supply Company which begins southwest of Tract C-a, crosses 84 Mesa and Ryan Gulch and Piceance Creek to the Piceance Dome gas field.

-- Western Slope Gas Company owns a 12 inch intertie which parallels Black Sulfur Creek, crosses Piceance Creek and terminates in the Piceance Dome gas field.

-- Northwest Pipeline Corporation recently completed a 8 5/8 inch pipeline known as the Union Sales lateral which connects the Union Oil Shale facility, to the compressor station at Magnolia Camp in the Piceance Dome gas field.



LEGEND
A - CO 13/789, Rifle to Rio Blanco
B1, B2 - Rio Blanco County Road #5 (Piceance Creek Road)
C - CO 13/789, Rio Blanco to Meeker
D - CO 64, Meeker to RBC #5
E - CO 64, RBC #5 to Rangely

Figure 1C-17 Affected Road Segments

TABLE II-27
AFFECTED HIGHWAY SEGMENTS (1980)

Segment Letter	Description From/To	Segment Length (miles)	Daily Traffic	Peak Hour Traffic (PHT)	Highway Capacity at 50 mph	PHT/ Capacity rate (%)	Total Accidents per year	Fatal Accidents per 10 years
A 2/	Colorado 13 from Rifle to Rio Blanco	19.3	1,800	252	865	29	55	3
B1 3/	Southern half of Rio Blanco County Rd 5	19.0	300	40	850 1/	5	8	1
B2 3/	Northern half of Rio Blanco County Rd 5	20.0	200	30	850 1/	4	6	1
C 2/	Colorado Highway 13 From Meeker to Rio Blanco	22.3	1,680	235	875	27	44	4
D 2/	Colorado Highway 64 From Meeker to County Road 5	17.1	740	104	820	13	18	2
E 2/	Colorado Highway 64 From Rangely To County Road 5	36.5	630	88	820	11	24	3

1/ Highway capacity at 40 rather than 50 miles per hour due to lower design standards.

2/ Source: Colorado State Department of Highways (1980a and b).

3/ Source: Cathedral Bluffs Shale Oil Company (Pysto 1982).

Peak Hour Traffic (PHT): This is an indication of rush hour traffic.

PHT/Capacity Rate: Indicates approximate traffic conditions on the highway during high use. If this ratio is near 85 percent, rural road capacity is approached.

-- Northwest Pipeline Corporation also owns a 10 inch trunkline known as the Piceance Creek trunkline which begins in the Piceance Dome gas field, follows Greasewood Gulch to Piceance Creek, runs northwesterly to Colorado Highway 64 which parallels into Rangely.

-- A 8 5/8 inch transmission pipeline owned by Rocky Mountain Natural Gas Company runs from Rock School to the south, past C-b Tract to DeBeque.

Numerous small gas gathering pipelines are concentrated in the Magnolia Camp area north and east of Piceance Creek. Many other gathering pipelines and production facilities are on public land, granted under Section 1 of existing oil and gas leases. Records of these pipelines are maintained with the Bureau of Land Management.

RAILROADS

Two railheads are in this region. One is located south of Craig, Colorado; the other at Rifle, Colorado. Both are serviced by the Denver and Rio Grande Western Railroad, which runs between Denver and Salt Lake City. An average of 14 trains a day can be expected to travel these routes. A rail system into Piceance Basin has been proposed, but no construction plans have been made (URS Engineers 1981).

CHAPTER III - CURRENT MANAGEMENT ALTERNATIVE (NO ACTION)

a. MINERAL ACTIVITY

The management of public minerals is separated into three basic categories: leasable, locatable, and saleable. The Mineral Lands Leasing Act of 1920 authorized that deposits of oil shale, oil, gas, coal, phosphate, sodium, potassium, asphalt and tar sands may be acquired only by a leasing system. Public lands with a known valuable leasable mineral are available through a competitive leasing system. Lands of unknown mineral potential are available through noncompetitive or negotiated lease sales.

Locatable minerals subject to the General Mining Law of 1872 include such minerals as gold, silver, copper, lead, molybdenite and uranium. In actuality, any mineral other than leasables and saleables, found on public lands in sufficient quality and quantity to make the lands valuable for that mineral may be subject to the General Mining Laws. Locatable minerals may be staked and filed on open public lands by any qualified claimant.

Saleable minerals authorized by the Materials Act of 1947, as Amended in 1955, include common varieties of sand, gravel, stone, pumice, pumicite, cinders and clay. These mineral materials may be disposed of by competitive sale or negotiated sale. In addition, free use permits for mineral materials are issued to other government agencies for public projects, as prescribed by 43 CFR 3600.

Mineral development within the Piceance Basin Planning Area is one of the most significant resource activities. The following discussion summarizes current mineral development and production within the Piceance Basin Planning Area.

LEASABLE MINERALS

Oil Shale

Attempts to recover shale oil in the Piceance Basin have met with varying degrees of interest and success since the early 1900's. The Mineral Lands Leasing Act of 1920 enabled the Secretary of Interior to lease oil shale on Federal lands, provided that no lease tract exceeds 5,120 acres, an annual rental of 50 cents per acre is assessed, and that no individual or firm can hold more than this total acreage under Federal lease in the United States. Except for these provisions, the Secretary was given broad discretion to select lease tracts and develop lease terms.

The first successful effort by the Department of Interior to lease oil shale began in the early 1970's with the Prototype Oil Shale Leasing Program. The goals of this program were established in 1973 by the Secretary of Interior. They are:

1. to provide a new source of energy to the Nation by stimulating the development of commercial oil shale technology by private industry;

2. to ensure the environmental integrity of the affected areas and at the same time develop a full range of environmental safeguards and restoration techniques that will be incorporated into the planning of a mature oil shale industry, should one develop;

3. to permit an equitable return to all parties in the development of this public resource; and

4. to develop management expertise in the leasing and supervision of oil shale development in order to provide the basis for future administrative procedures.

The initial prototype program was designed with the concept that six lease tracts in three states (Colorado, Utah and Wyoming) would be developed with significantly different mining and processing technologies, and that commercial-scale production of about 250,000 barrels per day (bbls/day) would be achieved by 1980. However, the Wyoming leases were not sold, and development of the Utah tracts was suspended due to legal ownership questions. Development has only recently resumed in Utah, postponing production plans by several years.

Of the protoype leases that were issued in 1974, two are located within the Piceance Basin Planning Area -- Tracts C-a and C-b. An additional tract may be issued in the Basin in 1983. Current oil shale management would be to manage these existing oil shale tracts, and to continue the prototype program until the goals and objectives of that program are met. Should there be a demand for more opportunity to develop oil shale; future lease tracts would be limited to those tracts identified in the prototype program and would encourage multiple mineral development.

Colorado lease Tract C-a, held by the Rio Blanco Oil Shale Company, originally proposed an open pit mine with aboveground retorting. They planned to dispose of the processed shale off-tract. Subsequent to leasing, the Department of Interior determined that it lacked adequate authority to lease surface use of off-site lands. C-a then switched to an experimental modified in-situ process which was successfully tested in 1981-1982. However, it was determined that the original open pit mining and surace retort proposal would provide for a more economic return and more efficient recovery of the resource as required by federal regulations incorporated into the lease. The lease terms were suspended in August 1982, awaiting approval to lease off tract acreage for spent shale disposal to accomodate an open pit mine. In December 1982, Tract C-a was given specific authorization by Congress to lease up to 6,400 acres of Federal land for off-tract disposal. BLM will begin analyzing this lease once an application is received. Upon approval, the lease suspension will automatically be lifted.

Tract C-b is leased to the Cathedral Bluffs Shale Oil Company. They originally proposed an underground mine with aboveground retorting. As development progressed, it was discovered that the shale may be too fractured to allow for the extraction of economic quantities of oil shale. Their plans were then changed to a modified in-situ process. C-b has also significantly slowed development operations while reevaluating engineering feasibility and awaiting improved economic conditions.

[The status of proposed lease Tracts C-11 and C-18 will be added to the final document.]

The Bureau of Mines has a research shaft located in Horse Draw. The Bureau of Mines has been actively studying mining, environmental problems, mitigation and processing tests for concurrent development of oil shale, nahcolite and dawsonite in the lower saline oil shale facies of the Parachute Creek Member of the Green River Formation.

The test shaft site has recently been operated by Multi Minerals Corporation under a cooperative agreement with BLM and the Bureau of Mines. The Bureau of Mines has completed their planned research activity at the facility. Currently, only custodial management is taking place until a decision is made on what the future of the facility will be.

The planning area contains a small portion of the Naval Oil Shale Reserves. In August 1982, the Department of Energy, managing agency of the reserves, determined that no development of the Reserves are necessary at the present time.

The only private oil shale venture in the planning area is operated by Equity Oil Company. Equity is currently conducting development and research activities on its 1,000 acre private tract in conjunction with the Department of Energy through a cooperative agreement. This steam injected in-situ project has been in operation since 1979 and is scheduled to continue until early 1983.

The location of the tracts is shown in Figure III-1.

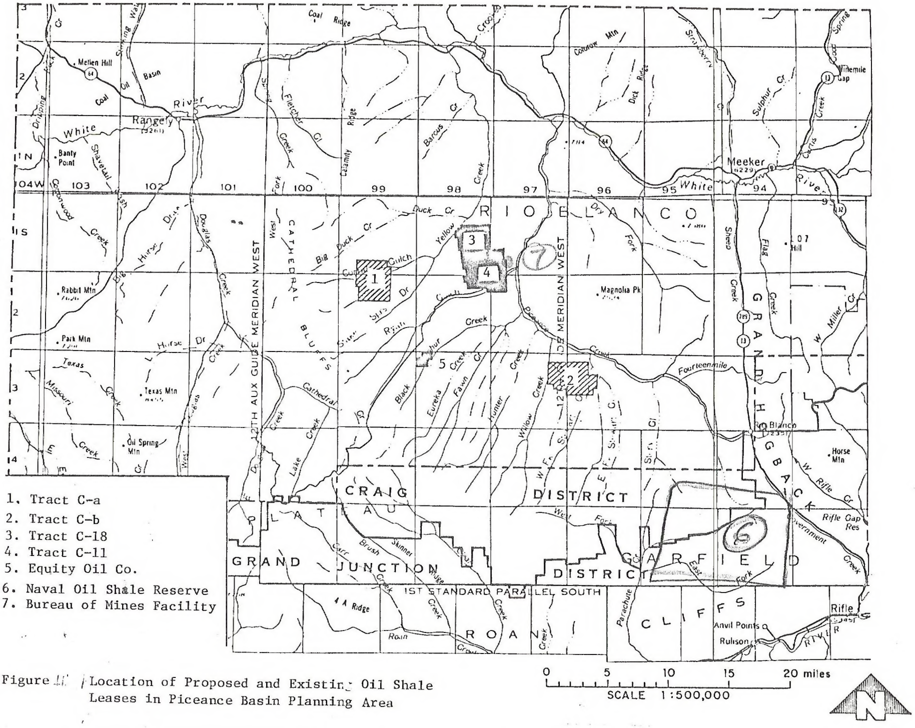
Additional management activities related to oil shale are the lands and realty actions which support private development in the Basin and on the Roan Plateau south of the planning area. This is discussed in the Lands and Realty section in this Chapter.

Demand and Dependency

The demand for shale oil must be considered in relation to available petroleum supplies, both domestic and imported. Presumably, large quantities of petroleum still remain to be discovered in the United States. This, in addition to the relatively inexpensive price of crude oil, will only further delay the development of the oil shale industry. However, in a national or world-wide crisis, shale oil may be needed as fast as industry can enter the market.

Sodium

Two existing sodium leases are located in the planning area. These leases were issued in 1971. They consist of a 1,320 acre tract held by the Rock School Corporation, and 8,360 acres held by the Wolf Ridge Corporation (see Figure III-2). Development has yet to occur on either lease tract and the potential for sodium mining on either tract in the near future is unknown.



1. Tract C-a
2. Tract C-b
3. Tract C-18
4. Tract C-11
5. Equity Oil Co.
6. Naval Oil Shale Reserve
7. Bureau of Mines Facility

Figure 11 / Location of Proposed and Existing Oil Shale Leases in Piceance Basin Planning Area

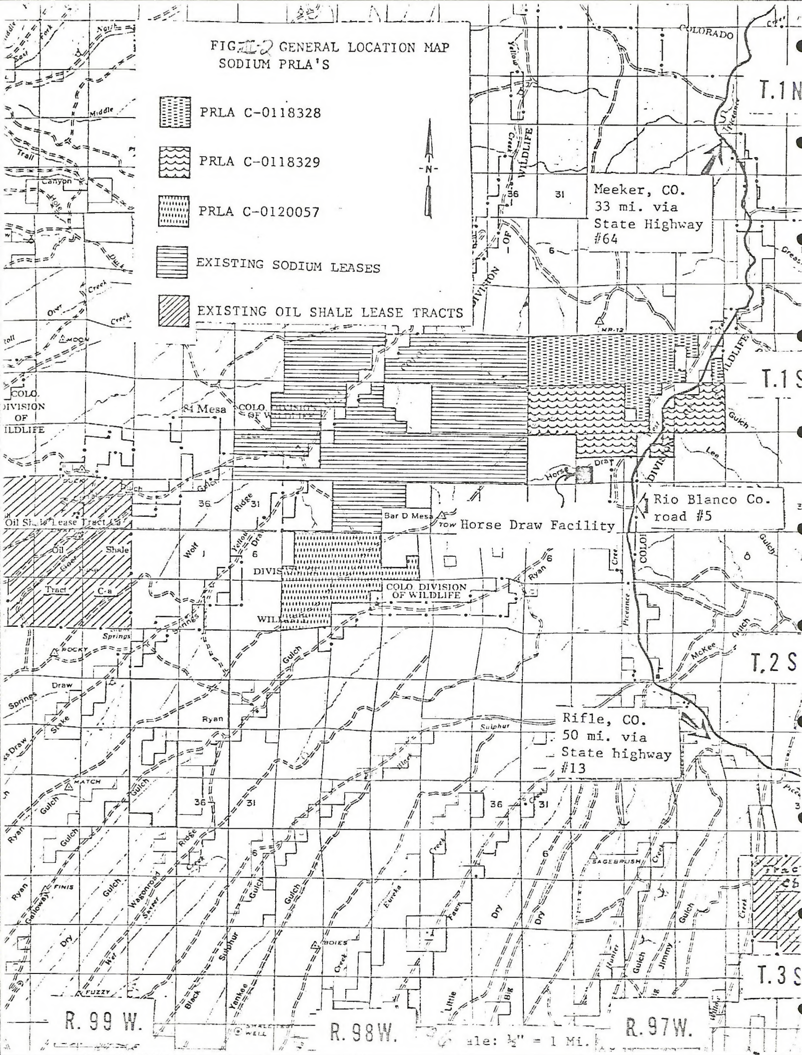


FIG. II-2 GENERAL LOCATION MAP SODIUM PRLA'S

BLM is also in the process of evaluating three sodium Preference Right Lease Applications on 7,157 acres of land adjacent to the existing sodium leases (see Figure III-2). These three tracts could result in two potential sodium mines. Once initial showing is made by the lease holders, BLM will determine whether or not the tracts are chiefly valuable for sodium. If they are, the Preference Right Lease Applications could also become sodium leases. The potential for development of these tracts is unknown at the present time.

All of these tracts are located near the depositional center of the Piceance Basin where oil shale as well as sodium minerals (nahcolite, dawsonite and halite) are the richest. Future BLM management of these lands is not likely to include leasing for sodium minerals only until the existing leases are developed. However any future sodium mineral leasing, will emphasize the development of oil shale and sodium minerals concurrently, such as the 1983 prototype lease (offering, lease sale, attempted lease sale).

Demand and Dependency

Nahcolite could be used as a raw material for several industrial uses now dominated by the trona industry of Wyoming. More ecologically significant and of more immediate value is the potential use of nahcolite as a sulfur to remove dioxide from power plant stack gases.

Dawsonite, a potential source of alumina, may be recovered in conjunction with oil shale or nahcolite mining. The United States presently imports alumina to produce over 5 million tons of aluminum per year which provides over 90 percent of U.S. consumption. By the end of the century, it is estimated that 98 percent of the alumina used in the U.S. will be imported (Beard et al 1974).

Coal

The planning area lies within the Uinta Coal Region and includes part of the lower White River Field in the northwest corner of the planning area and the Grand Hogback Coal Field on the eastern boundary.

The coal resources of the planning area are generally located at depths ranging from 3,000 to 6,000 feet, except along the periphery of the Basin. For this reason, coal production has been limited within the planning area because more accessible coal has always been available outside the Basin. Several mines were located in the northwest corner of the planning area but none are presently operating nor are their production records known. Western Fuels' Deserado mine located immediately northwest of the area is presently being developed.

Approximately 32,000 acres of the Lower White River Known Recoverable Coal Resource Area are located in the northwest corner of the planning area (Figure III-3). In addition, there are two coal leases in this area totalling approximately 760 acres. Presently there are no plans to lease additional tracts within the planning area except for lands adjoining existing leases.

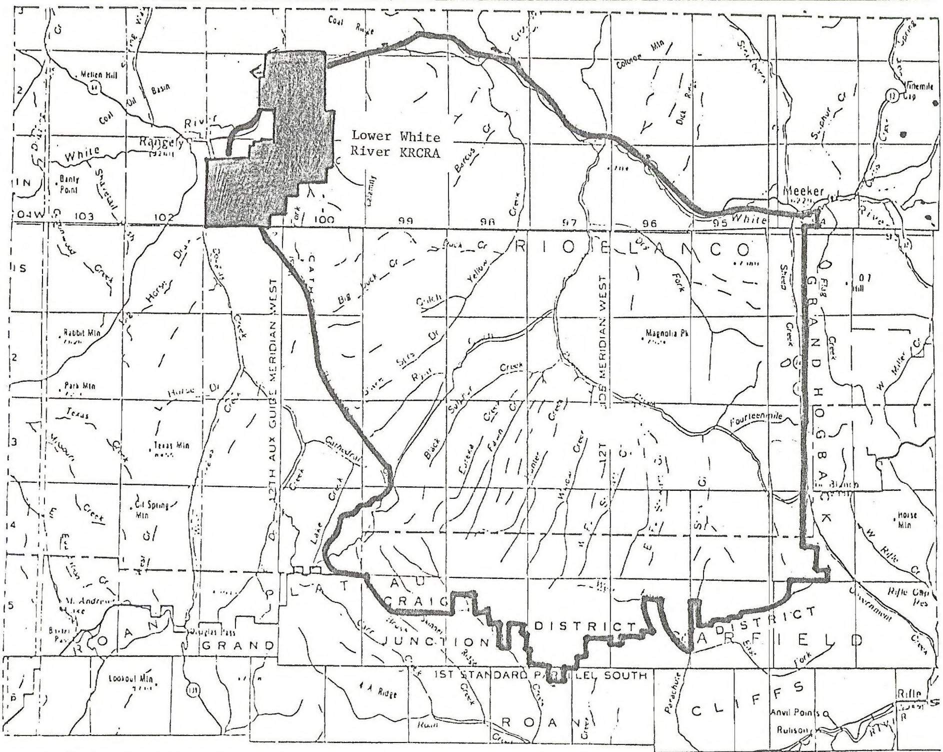


Figure III-3 KRCRA within Piceance Basin Planning Area

Coal Unsuitability Criteria

The Bureau of Land Management, under the Surface Mining Control and Reclamation Act of 1977, is required to review Federal lands through land use planning assessments with regard to the unsuitability of those Federal lands for all or certain stipulated methods of coal mining. Bureau methods for assessing unsuitability are defined in the planning regulations (43 CFR 1601: 16-6) and the coal regulations (43 CFR 3461).

The 20 criteria addressing unsuitability for the surface mining of coal were applied to the lower White River Known Recoverable Coal Resource Area. This report is available in the White River Resource Area office. Approximately 5,260 acres of the Known Recoverable Coal Resource Area located within the planning area were determined to be unsuitable for surface methods of development (Figure III-4). __________ acres within the area were determined to be unsuitable for subsurface development.

Demand and Dependency

The economic conditions for production of coal in the planning area with present technology at this time is low. The demand for low sulfur coal from Colorado has increased in recent years; however, the depth of the coal within the area and associated transportation costs outweigh any advantages for increased production. The potential for in-situ coal gasification or liquefaction is unknown but remains feasible.

Oil and Gas

Oil and gas production has been and remains the most significant mineral activity within the Piceance Basin Planning Area.

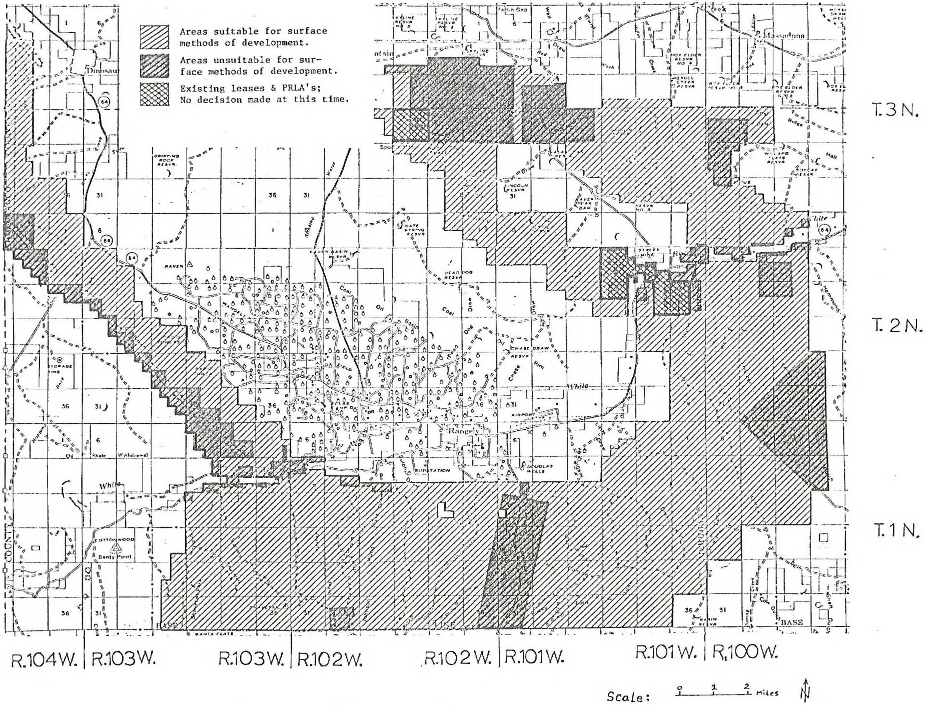
Oil and gas resources under Federal management are made available through a leasing system, as mandated by the Mineral Lands Leasing Act of 1920. When the resources are located within a Known Geologic Structure, they are leased by competitive bid. Areas outside the Known Geologic Structure are leased through a noncompetitive or negotiated bidding system (Figure III-5).

Production

Natural gas comprises the principle mineral production of the planning area, although some oil has been obtained from almost every producing horizon. Most of the pools are stratigraphically controlled, however, some structural traps do exist. Most sandstones within the planning area are capable of producing gas, rendering the entire planning area potentially valuable for oil and gas, although reservoir quality and permeability are generally low.

The first major Tertiary production was in 1930 with the discovery of the Piceance Creek Gas Field. Piceance Creek South was discovered in 1954 and the Sulfur Creek Field in 1959. Oil and gas exploration, development and production have continued at a moderate pace since.

Figure III-4 Known Recoverable Coal Resource Areas in the Piceance Basin Planning Area



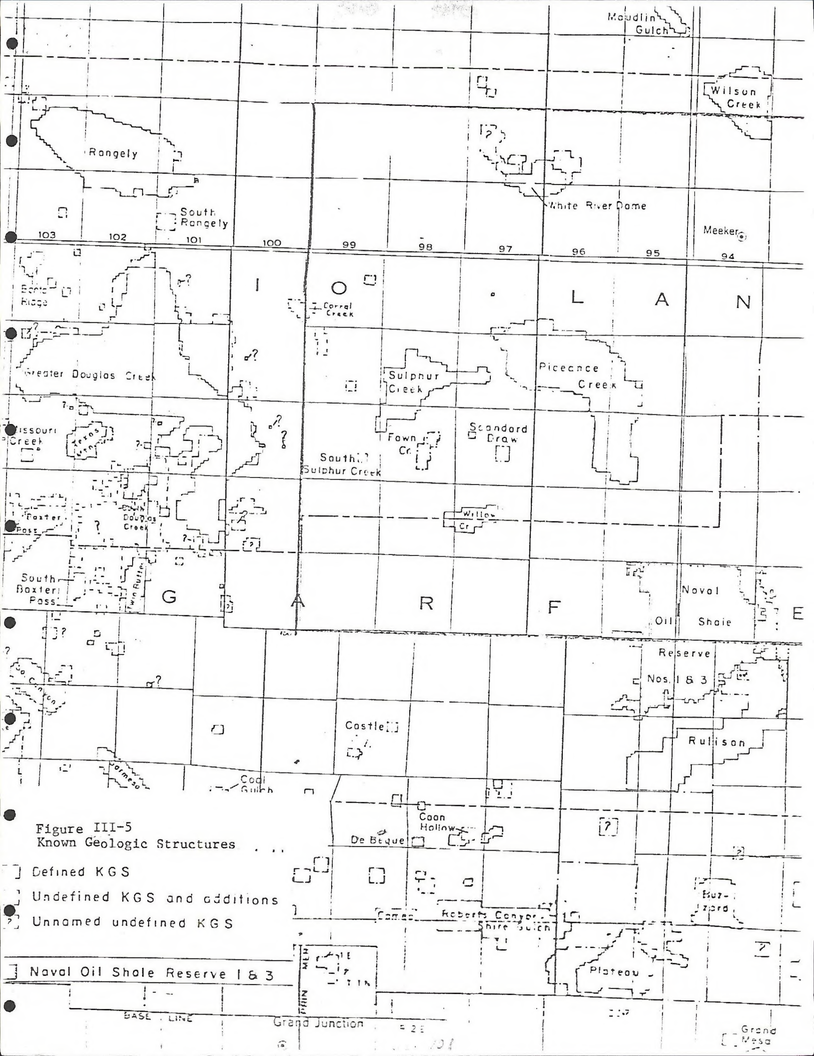


Figure III-5
Known Geologic Structures

The planning area contains 13 oil and gas fields (Figure II-7). In addition, the BLM has identified seven Known Geologic Structures in the planning area. These structures somewhat overlay the known oil and gas fields and define the areas of competitive leasing (Figure III-5).

Production figures for oil and gas fields within the planning area are shown in Table III-1. Production from the planning area for 1981 amounted to 9,531 bbls of oil and 6,406,368 mcf of gas. Almost 100 percent of this production is from Federally managed land. In addition, the planning area is almost entirely covered by oil and gas leases.

Production of oil and gas can be expected to conflict with production of other minerals, especially oil shale, sodium and coal. Of particular interest are those areas presently leased for oil shale, sodium and Known Recoverable Coal Resource Areas.

Demand and Dependency

The demand for oil and gas must be considered in relation to available petroleum supplies, both domestic and imported. National and regional demand for natural gas within the Piceance Basin is expected to be low due to the large quantities of gas being found in deep deposits elsewhere in the United States such as the Overthrust Belt in Wyoming, drilled within the last four years. The State of Colorado, however, has designated low permeability gas formations in the Piceance Basin as Tight Gas Formations. These formations have economic incentives to encourage the development of the natural gas known to exist in them.

LOCATABLE MINERALS (SUBJECT TO THE GENERAL MINING LAW OF 1872)

Being predominately a sedimentary structure, the Piceance Basin Planning Area is not noted for areas of magmatic, metamorphic or hydrothermal mineralization. Sedimentary deposits of uranium-vanadium, limestone-dolomite and gypsum are found within the planning area, but are not considered economically recoverable at this time. Consequently, no locatable minerals are currently being produced from the planning area. However, prior to the Mineral Lands Leasing Act of 1920 all minerals were considered locatable. As a result, thousands of oil shale claims (USDI, BLM 1982d) as well as hundreds of asphalt claims (USDI, BLM 1982c) were staked and filed within the planning area. Presently, over 750 oil shale unpatented claims are still recorded within the area. In addition, approximately 25 patent applications have been received for claims within the area. The validity of these claims is currently being contested in the courts by the Bureau of Land Management. All asphalt lode claims were declared null and void in 1971 (USDI, BLM 1982c). Over 200 asphalt placer claims are still being contested in the Courts by the BLM. Lands containing oil shale deposits were withdrawn from mineral entry by numerous Executive Orders, Public Land Orders and various classifications. For more information concerning these segregations, refer to the Lands and Realty section of this chapter.

The management of locatable minerals is governed by the Surface Management Regulations (43 CFR 3809) which provide for the management and reclamation of all lands subject to the General Mining Law of 1872.

TABLE III-1
OIL AND GAS PRODUCTION

Field-Formation	Number of Producing Wells	1981 Production Oil (bbls.)	1981 Production Gas (Mcf.)	Total Production Oil (bbls.)	Total Production Gas (Mcf.)
Corral Creek, Dakota	2	68	63,6621	68	63,662
Corral Creek, Dakota/Morrison	1	0	180,564	23	274,749
Corral Creek, Mancos B	2	231	62,904	484	144,661
Piceance Creek, Douglas Creek	11	0	287,768	0	51,431,361
Piceance Creek, Dougals Creek/Wasatch	1	0	2,227	0	340,389
Piceance Creek, Mesaverde	2	1,458	175,569	8,666	1,334,363
Piceance Creek, Wasatch A	31	647	3,917,535	7,207	67,453,004
Piceance Creek, Wasatch D	SI	0	0	0	366,400
Piceance Creek, Wasatch F	2	77	84,187	397	560,536
Piceance Creek, Wasatch G	5	552	987,097	100,989	61,424,197
Piceance Creek South, Douglas Creek	1	0	24,122	450	2,210,798
Powell Park, Fort Union	P&A	0	0	189	251,532
Powell Park, Mesaverde	P&A	0	0	3,102	16,354
Powell Park, Mancos B	1	0	1,464	0	7,376
Powell Park, Wasatch	P&A	0	0	1,016	0
Sage Brush Hills, Mancos A	2	152	35,683	188	67,989
Sage Brush Hills, Mesaverde	SI	0	0	0	1,063
Sulphur Creek, Mancos B	SI	0	0	0	23,852
Sulphur Creek, Ft. Union/Wasatch	SI	0	0	122	3,031
Sulphur Creek, Mesaverde	SI	0	706	229	24,025
Sulphur Creek, Piceance Creek	SI	0	0	583	0
Sulphur Creek, Wasatch	P&A	0	0	865	0
Sulphur Creek South, Parachute	SI	0	0	0	6,551
Sulphur Creek South, Wasatch G	SI	0	0	0	391,461
White River, Mesaverde	5	3,898	83,291	16,301	1,318,612
White River, Wasatch (con't)	6	0	490,755	0	5,968,301

Source: Colorado Department of Natural Resources, Oil and Gas Conservation Commission 1981.

SALEABLE MINERALS

Common varieties of mineral materials occurring within the planning area include significant deposits of sand, gravel, building stone, riprap, decorative stone and clay.

Sand and gravel deposits within the planning area occur primarily along the White River and its tributaries. Numerous pits can be found on both private and public lands in the area. Total reserves are unknown as well as the exact location of mineral material reserves. However, adequate quantities of sand and gravel for industrial purposes as well as road construction have been available in the past and are expected to remain so. From 1980 to 1982, mineral material sales from public lands in the planning area totalled over 270,000 cubic yards valued at 73,000. An average of four permits for 70,000 cubic yards each are received each year in the planning area.

Colluvial deposits, commonly known as "pit run" consisting of unconsolidated sand, silt and rock debris can be found throughout the area. This material is generally of poor quality but is used to augment sand and gravel for road construction and maintenance because of its accessibility and abundance.

Building stone, riprap and decorative stone occur throughout the area. Principally derived from the Green River Formation and the Mesaverde Group the quantity is considerable but the exact total is unknown. Total amount of production of these materials in the area is unknown and is spotty at best.

Clay deposits within the Mesaverde Group and the Wasatch Formation are extensive. No production has been reported from the area, however.

Demand and Dependency

The demand for sand, gravel and pit run from the area has fluctuated in the past with short periods of industrial activity. Future mineral activity in the area will place a greater demand on the mineral materials; however, sufficient quantities are estimated to exist within the planning area to accomodate a significant increase in mineral activity.

Building stone and moss rock demand has been at a standstill recently after experiencing some popularity in the past. No significant increase in demand is expected for these materials in the near future.

The demand for riprap within the area has been limited, although some has been used locally on roads.

No clay has been produced from the area nor is any expected until a market develops.

b. WATER RESOURCE MANAGEMENT

The present management of water resources in the Piceance Basin Planning Area is limited to maintaining water quality at existing levels. For the most part this consists of applying stipulations to activities on public lands which might pollute or lower water quality.

Support is given to other resource activities in feasibility studies and project design for the development of water sources and facilities. Management also requires an analysis of impacts on major federal leasing and right-of-way actions which could potentially affect the water resource.

SURFACE WATER

The current program is primarily an ongoing inventory of surface waters, which includes a baseline of sources, flow data, water quality and floodplain delineations. The U.S. Geological Survey, Water Resource Division is currently monitoring numerous sites in the planning area for water quality, flow data, and sediment yield, (this varies with monitoring site instrumentation and funding capabilities).

Inventory of all locatable spring sources in the planning area is to be completed by October 1983. A summary of the information gathered will be available at the White River Resource Area upon completion of the inventory.

A stream channel stability inventory is planned for the summer of 1984 on all perennial and critical intermittent stream channels. A stream channel stability form developed by the U.S. Forest Service will be used to measure the hydrologic stability of these channels.

GROUNDWATER

Groundwater resources within the planning area have been studied extensively by numerous private organizations, universities and Federal government agencies. The Bureau's main management objective in relation to groundwater is to maintain and ensure the integrity of the present aquifer system both in quantity and quality throughout the Piceance Basin and surrounding areas. Mineral development (oil shale, sodium and possibly coal) has the greatest potential to impact groundwater resources in the Basin.

Groundwater has been developed and is used by private industry, ranching operations and by the Bureau for range and wildlife management. In addition, numerous monitoring projects are currently underway within the planning area by both private industry and Federal agencies.

WATER MANAGEMENT REGULATIONS

Several regulations govern and affect water management. At the local level, the Colorado West Area Council of Governments has completed their 208 Water Management Plan. This could mandate some water quality controls for the public lands, but the plan is presently under a court injunction while future planning and refinement is determined.

The State of Colorado is currently classifing the state's waters and streams and setting water quality standards. The Bureau's water quality management practices will be dependent upon these standards. By adhering to the State's standards, the Bureau would also meet the requirements of the Federal Water Pollution Control Act, the Colorado River Basin Salinity Control Act and the Clean Water Act.

WATER RIGHTS

The Bureau has filed applications for numerous water sources in the planning area. Reserved water rights claims for 153 springs in the area were filed as part of the general state adjudication of 1972. In addition, applications for 19 wells were made by the Bureau as a part of that adjudication. Since 1972, many new springs have been identified and other numerous new water facilities have been developed. In accordance with State law, the Bureau has filed for appropriation rights for springs, wells and stock water reservoir storage rights between 1972 and 1983.

Public water reserves are springs and water holes that were reserved by the U.S. Government by executive order in 1926 for domestic and livestock water supplies. The purpose was to prevent monopolization of large tracts of arid grazing land by the control of water sources.

DEMAND AND DEPENDENCY

Two major demands on water resources presently exist within the planning area. Local demand for irrigation and domestic water along with wildlife and livestock usage competes with industrial interests. This surface water use is highly dependent upon the groundwater discharge which supplies 80 percent of the annual runoff (18,000 acre feet) of the Basin (Weeks et al 1974).

Runoff from the Basin is affected by irrigation diversions and consumptive use by crops, native vegetation, evaporation and livestock and wildlife use. Streamflow depletions resulting from irrigation demand is approximately 5,000 acre ft/yr.

Ranching operations in the planning area remain in a somewhat static condition in relation to water use, however, as energy development continues to increase, competition for surface flow throughout the Piceance Basin will remain a major area of concern. The social values associated with water resources in the planning area involve retaining natural flow and quality conditions for ranching operations while still providing water needs for the anticipated industrial growth within the Basin.

c. SOILS MANAGEMENT

CURRENT MANAGEMENT

It is White River Resource Area policy to protect, maintain or improve the quality of the soil resource. The objectives of the soil program are to impede deterioration of soil conditions and to stabilize and rehabilitate areas where accelerated erosion and runoff have resulted in unacceptable resource conditions.

The soil resource is the basis for all biological production. It is also the construction material for roads, drill pads, foundations, pits and reservoirs. During pre-project planning and investigations, detailed soil maps are used and soil properties are analyzed to determine soil productivity potential and engineering suitability. This avoids implementing management practices on undesirable sites. On-site soil investigations are used to make specific recommendations on project locations. Areas with high wind and water erosion susceptibility, saline soils and especially steep clayey slopes are avoided. Reclamation measures are stipulated to maintain soil productivity and stability.

RESOURCE CONDITION AND TREND

Soil resource condition and trend is slowly improving throughout the planning area due to improving vegetation conditions from recent rangeland management practices. Soil management efforts on energy related activities have influenced site location to areas of more stable and less erosive areas. This has slightly reduced the amount of erosion and sedimentation.

DEMAND AND DEPENDENCY

The demand for vegetation production from livestock and wildlife objectives results in an increased emphasis on soil productivity. Soil disturbance associated with energy development places a greater demand on undisturbed sites and increases the need for acceptable soil management practices.

d. FORESTRY

The forest resources of the planning area include Douglas fir sawtimber and firewood, pinyon firewood and Christmas trees and juniper fenceposts and firewood. Locations of forest and woodland stands are shown on surface cover type maps which were developed from interpretation of infra-red aerial photographs. These maps are available for review at the White River Resource Area office.

Management of forest resources is implemented primarily through the sale of forest products. This is accomplished through advertised and negotiated commercial sales, and individual negotiated sales of all forest products. In 1983, approximately 2,500 cords of pinyon-juniper firewood and 250,000 board feet of Douglas fir sawtimber are planned to be sold through commercial sales as identified in the White River Resource Area 5-year sale plan. Additional sales of products to individuals and commercial interest are anticipated, and are handled on a case-by-case basis.

Current management is based on decisions and directives from the existing Management Framework Plan for the White River Resource Area (USDI, BLM 1981) and Bureau-wide policy directives.

The current management objectives for sawtimber and pinyon-juniper woodlands are to manage, in perpetuity, these forested areas for a sustained annual yield. This objective is supported by a Management Framework Plan decision to develop and implement a forest management plan. The first step in preparing a management plan, locating, mapping and classifying timber stands, is currently underway.

Directives from the Woodland Management Policy Statement include recognizing woodlands as distinct ecosystems to be managed and perpetuated for the production of multiple resource values. These values include wood products, livestock forage, wildlife habitat, recreation uses, watershed protection and minerals. Another directive is to develop and maintain an extensive inventory and classification of public woodlands. This information will be used to determine productive capabilities and to ensure an orderly harvest of available woodlands. Another desired goal of a woodlands program is to achieve a positive benefit/cost ratio.

Overmature, decadent, or stagnated stands of timber and woodlands can be returned to a productive status, through harvesting and allowing for regeneration in the sale design. The goal of perpetuating all forest and woodlands stands is gradually being achieved. Forage and browse species are also expected to increase in harvested areas and will improve livestock grazing and big game habitat. Care is taken during sale layout to protect raptor and cavity nesting sites. Overall, timber harvesting results in a trend toward improvement of forest, range, wildlife and watershed resources while generating funds to ensure the continuance of a forest management program.

Energy development within the planning area frequently requires clearing of forested areas. These include exploration and development operations for oil and natural gas, oil shale and coal, as well as the associated right-of-ways for roads, pipelines, and transmission lines.

Upon project approval, an appraisal is conducted using detailed maps and aerial photographs. Volumes and values of timber to be cleared are estimated and prices are set in the same manner as negotiated commercial timber sales. Project operators are required to purchase all timber at the appraised value prior to beginning the project.

Stipulations for timber disposal and rehabilitation of the site are included in all approved project documents. Currently, most of the development operations do not involve large-scale clearing of forested areas. Total disturbance is usually less than five acres with most one-half to two acres in size. Commercial forest acres of Douglas fir are seldom affected, since most energy developments are at the lower elevations where pinyon-juniper woodlands are usually involved. In the long run, forest management capabilities are assisted by energy development as a result of the increased construction of new roads for energy-related use.

DEMAND AND DEPENDENCY

Local demand for Douglas fir sawtimber is almost entirely attributable to the only wood processing mill in Meeker. Although the mill purchases sawtimber from nearby U.S. Forest Service lands, Douglas fir on BLM land is generally closer and at lower elevations, thereby allowing longer work seasons. The mill requests a continuing supply of Douglas fir sawtimber from BLM lands, the majority of which will be harvested in the planning area. Future forest management plans will consider local mill demands for sawtimber when determining volumes to be offered for sale.

The local mill is the only sawtimber processing facility within 100 miles of the planning area. In recent advertised sales, no bids were received from other than the local mill.

Douglas fir is the preferred species of sawtimber for producing large dimension lumber and bridge planks. As a result, Douglas fir has a higher value than other sawtimber species at the mill.

Local demand for pinyon-juniper firewood is primarily from residents of Meeker, Rangely and Rifle who are cutting wood for personal use. The U.S. Forest Service also offers the opportunity for these residents to harvest firewood, however pinyon, the preferred species, is available only on BLM lands. BLM lands in the planning area are generally closer to the population centers and are more easily accessible during the winter months. At present, the supply of firewood far exceeds the local demand.

Commercial firewood cutters seeking pinyon are attracted to the planning area from the Denver, Grand Junction, Vail, Aspen, Craig and Steamboat Springs markets in response to the high quantity and quality of products located here. This regional demand, as well as dependency, is expected to increase in the future as a result of suitable firewood cutting areas close to these urban centers becoming more difficult to find. Several other species are marketed as commercial firewood, however pinyon is the most preferred, commanding a significantly higher price than other regionally harvested species.

Currently, the volumes offered through commercial firewood sales are based on the public demand. This determination is addressed on the basis of public inquiries and requests for forest products, outcome of past commercial firewood sales, and analysis of market conditions. In the future, with completion of a woodland inventory and preparation of a woodland management plan, an annual allowable harvest figure can be determined. This is necessary to determine the best methods for satisfying the public demand for forest products while insuring that a sustained yield from woodlands is perpetuated.

e. LIVESTOCK GRAZING

CURRENT MANAGEMENT

Livestock grazing on public lands in the planning area involves 32 livestock operations on 42 allotments ranging in size from 764 to 156,091 acres. Thirty-seven are cattle allotments, five are sheep allotments and three operations run both cattle and sheep.

At present, five cattle allotments are intensively managed under Allotment Management Plans. These allotments cover approximately 40 percent of the area and utilize approximately 30 percent (20,820 AUMs) of the total AUMs of active use in the planning area. Of the remaining allotments, 24 were proposed for Allotment Management Plan implementation and five were to be less intensively managed as indicated in the White River Resource Area Draft Environmental Impact Statement on Grazing Management (USDI, BLM April 1980). Allotment Management Plan implementation schedules as proposed in that statement will not be met due to funding and manpower restrictions.

Periods of use on public lands within the Piceance Basin are variable, depending on elevation, water availability and allotment size. Generally, the lower elevations are used for spring and winter range, the mid-elevation zones for summer/fall range. Some allotments are used on virtually a year-round basis while others are used only seasonally.

The earliest that grazing is permitted in the spring is March 1, however, spring use may be made as late as June 20 depending on allotment elevation. When available livestock forage or water is depleted, grazing use ceases and livestock are removed from the allotment or moved to higher elevation rangeland.

The majority of the public lands in the planning area (91 percent) are grazed by cattle with nearly equal amounts of use in all seasonal periods. Approximately 90 percent of this use occurs on allotments having continuous cattle use from spring through fall and on those having yearlong use. Consult the White River Resource Area Environmental Impact Statement on Grazing Management (USDI, BLM April 1980) for specific allotment use.

Sheep grazing occurs on nine percent of the public lands in the planning area, all of this use occurs on spring and fall ranges. Sheep operations in the planning area utilize the allotments in transition between BLM winter ranges in the Rangely Planning Unit and summer ranges on U.S. Forest Service lands. Lambing normally occurs on both private and BLM lands while winter feeding, when necessary, occurs on private and state lands. Coyote predation is a major factor in determining the nature and extent of sheep use made within the planning area.

Allotments grazed by both cattle and sheep total three percent of the area.

Livestock trailing (principally sheep) in the planning area occurs on the White River Trail which lies west of Piceance Creek and immediately south of the White River extending to Rangely. The White River Trail from the mouth of Piceance Creek to the mouth of Douglas Creek includes 4,320 acres of public land with an average seasonal licensed trailing use of 441 AUMs. The trail is used to move sheep to and from winter and spring ranges near Rangely and in Utah.

Livestock operations in the area have evolved around the use of public lands (BLM) and intermingled private and state lands as the basis of a range livestock operation. Hay is produced on private, irrigated lands to provide feed during winter periods when livestock are not on public land. Winter feeding is normally carried out from January through mid April.

The White River Resource Area Draft Environmental Impact Statement on Grazing Management (USDI, BLM April 1980), the Rangeland Program Summary (USDI, BLM April 1981) and the Rangeland Program Summary Update (USDI, BLM Dec. 1981) focused on forage allocation and grazing management. The documents discussed five major actions: 1) initiation of intensive grazing management, 2) continuation of existing grazing management practices, 3) allocation of forage among the predominant grazing animals and other uses, 4) prescription of a minimum period of rest from livestock grazing for each allotment and 5) development and construction of range improvements to enhance rangeland productivity and management.

Subsequent to the release of those documents, the level of rangeland management in the planning area has been intensified as a result of the implementation of two new Allotment Management Plans and the development of range improvements on the five allotments presently being intensively managed. However, the proposed Rangeland Management Program as identified in the aforementioned documents will not be implemented at the previously anticipated level due to budgetary restrictions.

Decisions adjusting livestock grazing use in the planning area were completed in the spring of 1982. The level of existing grazing use indicated here represents the initial stocking level of three to be implemented over a five year period as a result of the decisions. Further adjustments will be tied to the results of rangeland monitoring studies presently in progress (consult Table III-2).

The amount of grazing use varies among operations. Some permittees use all their authorized animal unit months while others, due to economic conditions, are not fully utilizing their preference. Present average active livestock use in the planning area is 55,324 AUMs annually (based on a five year average excluding trailing use), which is 2,065 AUMs below the maximum authorized use of 57,389 AUMs.

For more detailed information on livestock grazing in the planning area consult the 1980 White River Resource Area Draft Environmental Impact Statement on Grazing Management (USDI, BLM April 1980), the Rangeland Program Summary (USDI, BLM April 1981), the Rangeland Program Summary Update (USDI, BLM Dec. 1981) and the Piceance Basin Planning Unit Resource Analysis, Step III (USDI, BLM 1980).

RESOURCE CONDITION AND TREND

Since the beginning of the implementation of the White River Resource Area Grazing Management Environmental Impact Statement (USDI, BLM April 1980) in May 1980, there has been a noticeable improvement in range condition and apparent trend in the Piceance Basin.

While the effect of above normal growing season precipitation on forage production cannot be disregarded, measurable improvement in range condition can be directly attributed to range improvement practices in specific areas. These range improvements include fences, water developments, vegetation manipulations and improved livestock management practices. The overall effect

TABLE III-2
ALLOTMENT ACTIONS PROPOSED

Allotment		Percent Federal Range 1/	Kind of Livestock	Present 2/ Authorized Livestock Use AUMs	Actual 3/ Livestock Use (AUMs)	Scheduled Adjustments in Present Authorized Use (AUMs)			Monitoring Program 5/
No.	Name					1982	1984	1986 4/	
6001	Puckett Gulch	3	Cattle	21	21	21	21	21	A/U/T/C
6002	Pine Knot Gulch	60	Cattle	96	98	96	96	96	A/U/T/C
6003	Wood Road Gulch	50	Cattle	72	72	72	72	72	A/U/T/C
6004	Powerline	50	Cattle	71	71	71	71	71	A/U/T/C
6005	North Dry Fork	100	Cattle	1,005	1,005	940	875	810	A/U/T/C
6006	Little Hills	100	Cattle	5,691	5,076	5,263	4,834	4,405	A/U/T/C
6007	Main Dry Fork	100	Cattle	1,536	1,536	1,428	1,320	1,320	A/U/T/C
6008	Segar Gulch	85	Cattle	3,499	2,543	3,183	2,867	2,550	A/U/T/C
6009	Hyberger	100	Cattle	390	391	349	307	265	A/U/T/C
6010	Little Rancho	100	Cattle	260	260	229	197	165	A/U/T/C
6011	Thirteen Mile	100	Cattle	1,020	896	892	764	635	A/U/T/C
6012	Fourteen Mile	23	Both	850	773	694	538	380	A/U/T/C
6014	Lower Fourteen Mile	75	Sheep	150	150	150	150	150	A/U/T/C
6015	Gordon Gulch	44	Sheep	450	450	450	450	450	A/U/T/C
6016	Davis Creek	31	Sheep	546	378	518	490	490	A/U/T/C
6017	Coyote-Schutte	62	Sheep	578	561	578	578	578	A/U/T/C
6019	Cow Creek	45	Both	2,083	1,647	1,934	1,785	1,635	A/U/T/C
6022	Davis Canyon	60	Cattle	195	195	175	155	135	A/U/T/C
6023	Piceance Mountain	62	Cattle	14,716	14,586	13,912	13,109	12,305	A/U/T/C
6024	Fawn Creek	71	Cattle	2,465	2,461	2,322	2,179	2,035	A/U/T/C
6025	Skinner Ridge	30	Cattle	286	284	286	286	286	A/U/T/C
6026	Reagles	100	Cattle	1,266	1,616	1,616	1,616	1,616	A/U/T/C
6027	Square S	74	Cattle	4,390	4,070	4,390	4,390	4,390	A/U/T/C
6028	Hatch Gulch	100	Cattle	760	762	760	760	760	A/U/T/C
6029	Black Sulphur	71	Cattle	1,921	1,916	1,921	1,921	1,921	A/U/T/C
6030	Yellow Creek	81	Cattle	3,618	3,118	3,618	3,618	3,618	A/U/T/C
6031	Duck Creek	90	Cattle	1,490	1,488	1,490	1,490	1,490	A/U/T/C
6032	Spring Creek	95	Cattle	4,567	4,570	4,487	4,405	4,405	A/U/T/C
6033	E. Fork Spring Creek	52	Cattle	321	322	321	321	321	A/U/T/C
6036	Greasewood	92	Cattle	1,687	1,685	1,687	1,687	1,687	A/U/T/C

TABLE III-2
ALLOTMENT ACTIONS PROPOSED

Allotment		Percent Federal Range 1/	Kind of Livestock	Present 2/ Authorized Livestock Use AUMs	Actual 3/ Livestock Use (AUMs)	Scheduled Adjustments in Present Authorized Use (AUMs)			Monitoring Program 5/
No.	Name					1982	1984	1986 4/	
6038	Little Spring Creek	90	Cattle	1,183	385	1,057	931	805	A/U/T/C
6039	Hammond Draw	100	Cattle	215	215	215	215	215	A/U/T/C
6040	Upper Fletcher	100	Cattle	680	513	629	577	525	A/U/T/C
6041	Lower Fletcher	100	Cattle	612	311	612	612	612	A/U/T/C
6042	Boise Draw	100	Sheep	1,023	899	1,023	1,023	1,023	A/U/T/C
	Total			59,098	55,324	57,389	54,710	52,242	

1/ Percent livestock forage produced on public rangelands within an allotment versus production on private and state rangelands.

2/ Present Authorized Livestock Use = Active Qualifications December 1981.

3/ Actual Livestock Use = Average of active qualifications licensed for active use each year for past eight years December 1981.

4/ This is the initial livestock allocation which has been determined to be the proper livestock stocking level.

5/ U = Utilization; A = Actual use; T = Trend; C = Climate. The number of studies and frequency of data gathering will be determined by allotment management plans developed and budget constraints.

Source: Rangeland Program Summary, First Update (USDI, BLM December 1981).

of these developments has been to improve livestock distribution in the Basin and foster more uniform forage utilization, thereby enhancing rangeland productivity.

Following the beginning of implementation in May 1980, 28 miles of new fences have been constructed, 5 new wells have been equipped, 18 stock reservoirs and 4 miles of pipeline have been built. In addition, 8 springs have been reconstructed. Approximately 2,900 acres of sagebrush have been sprayed.

In 1983 in the Piceance Basin, one new well will be drilled, two wells will be equipped, 8.5 miles of pipeline will be constructed and 6 springs will be developed or reconstructed.

The primary thrust of the fencing program has been to provide for deferment of higher elevation summer range use to improve cover and production of key forage species. That such fencing is an effective range improvement practice is proven by the fact that one operator increased the average weaning weight of his steer calves by 50 pounds in the first year after division fence construction. This increase can be directly attributed to increased grass vigor and production as a result of deferment.

Virtually all range improvement work done in the last three years has taken place on allotments under Allotment Management Plans. The effect of these improvements is already noticeable.

DEMAND AND DEPENDENCY

Total livestock forage production in the planning area from state, private and public lands contributes 10 percent of the total regional (Rio Blanco, Routt and Moffat Counties) and 0.5 percent of the total state livestock feed requirements (Margolis 1976). Total livestock forage produced on the public land in the planning area contributes 3.0 and 0.2 percent of the livestock forage needs for the region and state respectively. Public land in the planning area provides 30 percent of the total planning area livestock forage requirements.

Table III-3 shows that 70 percent of the permittees in the Piceance Basin Planning Area depend on BLM administered lands for over 20 percent of their livestock forage and 50 percent of the permittees depend on these lands for over 30 percent of their forage. As a result of this, and the fact that much of the forage from public lands is required in the spring, the permittees depend substantially on BLM permits.

Fifty-seven percent of the permittees have a high dependency and 30 percent have a medium dependency on BLM grazing permits for forage on public lands (Table III-4). Spring forage is a key factor in determining dependency because ranchers must remove cattle from private meadows as early as possible to maximize hay production.

Eighty-three percent of the livestock produced in the planning area are produced on ranches that are highly dependent on public lands. Fourteen percent are produced on ranches that show a medium dependency.

TABLE III-3
PERCENT OF GRAZING OBTAINED FROM BLM LANDS BY OPERATORS HOLDING BLM PERMITS 1/

Percent of Forage Obtained from BLM Lands	Percent of Operators	No. of Operators
0 - 10	17	5
11 - 20	13	4
21 - 30	20	6
31 - 40	30	9
41 - 50	13	4
51 - 60	0	0
61 - 70	7	2
71 - 80	0	0
81 - 90	0	0
91 - 100	0	0
Total	100	30

1/ Source: Data on file at the White River Resource Area Office, Meeker, Colorado.

TABLE III-4
DEPENDENCE ON BLM GRAZING PERMITS 1/

Dependence	No. of Operators	Percent of Total
High	17	57
Medium	9	30
Low	4	13
Total	30	100

NOTE: High means that BLM forage is judged to be an essential element for the survival of the ranching operation. Medium means that BLM forage use may or may not be an essential survival element. Low means that BLM forage use is judged not to be essential to the ranching operation's survival.

A judgemental estimate of the criticality of rancher dependency on public land grazing was made by BLM personnel by applying the following three criteria to each ranching operation:

1. Proportion of forage acquired on public land
2. Season that forage is acquired
3. Ease of acquiring alternate sources of forage

1/ Source: Data on file at the White River Resource Area Office, Meeker, Colorado.

Since the gathering of data in 1978 for the White River Grazing Environmental Impact Statement (USDI, BLM April 1980), the percentage of forage provided by BLM administered lands in the planning area has risen slightly from 29.6 percent to 30.0 percent. Because almost all the ranches in this area have BLM permits, one can safely assume that BLM permittees' dependence on public land has also risen slightly. The major reason for this is because the livestock market has been in a slump the last few years. Production costs have been rising, with the exception of livestock grazing fees on public lands. The grazing fees have decreased from a high of $2.36 to a low of $1.40 during this time period.

There is a high demand for BLM grazing permits or leases. The present $1.40 per AUM fee that the BLM charges compares to a fair market value for western rangelands of $8.36 per AUM (USDA 1980). This does not mean that some permittees do not have more invested in their BLM permits than the $1.40 per AUM, especially if one considers mortgage costs (due to the value that BLM permits add to private land and the collateral they provide for bank loans) and maintenance costs not assumed by the BLM. However, it does mean that BLM would probably have little trouble in finding people to lease its grazing privileges at this current rate.

Ranching in the planning area is also socially and culturally significant. The Piceance Basin Planning Area is sparsely populated and agriculturally oriented. Even though towns such as Meeker and Rifle have grown recently due to energy development, there remains a large segment of the population with an agricultural orientation. Many townspeople come from ranches or have been around ranching all their lives. For the people in the Piceance Basin Planning Area, ranching is not just a business but a way of life.

f. WILD HORSES

In May, 1981, the Herd Management Area Plan for wild horses in the White River Resource Area was completed and approved. This plan designates the area on which horses will be managed and states how the maintenance of a viable herd will be achieved.

Sixty-four percent (105,424 acres) of the Herd Management Area lies within the planning area (Figure III-6). This area presently has an estimated population of 144 horses and includes all of the Yellow Creek allotment and Pasture C of the Square S allotment. The remaining 129 horses occur outside the Herd Management Area in six other allotments to the north and northwest.

There are essentially three distinct management units in that part of the Herd Management Area which lies within the Piceance Basin. These are Pasture C of the Square S allotment, Boxelder pasture of the Yellow Creek allotment and the Barcus-Pinto and Rocky Ridge pastures of the Yellow Creek allotment. All three areas provide a good mixture of seasonal ranges for horse habitat.

In 1979 and again in 1981, a total of 220 horses were gathered from the Pasture C and Boxelder use areas. Both areas had excessive populations in relation to the range carrying capacity and a deterioration in range condition was occurring. These areas presently have populations of 32 and 34 horses, respectively. The removal of excess horses from these areas has resulted in a

FIGURE III-6

Wild Horse Herd Management Area within the planning area

This map will show the location of the Herd Management Area within the planning area. It will also show allotment boundaries and pastures where wild horses occur.

marked improvement in range condition and production in both pastures. Maintenance of the population in both areas at this level should continue to foster further improvement in range condition.

In September, 1983 approximately 50 horses will be gathered in the Barcus-Pinto-Rocky Ridge area. If the operation is successful, approximately 45 horses will remain in the area, with subsequent small-scale removals to be made in later years.

Since the completion of the Herd Management Area Plan, one new water well in the Barcus-Pinto area has been drilled and equipped. One well, one water catchment and 680 acres of serviceberry-sagebrush burning are scheduled for 1984-1986 in Pasture C, Square S. For more detailed information consult the Herd Management Area Plan (USDI, BLM May 1981), the Cathedral Bluffs-Lower Piceance Basin Wild Horse Removal Plan (USDI, BLM January 1983) and the White River Resource Area Draft Environmental Impact Statement on Grazing Management (USDI, BLM April 1980).

g. WILDLIFE HABITAT

Current wildlife management in the planning area consists partially as a support function to range management and the development of oil shale, oil and gas. Recommendations are made to manage for energy development with minimal impact to the wildlife resource. The Piceance Basin Habitat Management Plan is currently being implemented to improve habitat conditions. Habitat Management Plan actions are directed to selected species of recreational importance, raptors and threatened or endangered species.

CURRENT MANAGEMENT

The Piceance Basin Habitat Management Plan, written in 1976 and updated in 1980, is the activity plan which provides a basis for coordinated achievement of wildlife and habitat management goals and objectives consistent with other resource uses. Three major objectives were identified and analyzed in detail: establishment of specific management goals, delineation of habitat improvement projects and identification of important inventories and monitoring studies.

Specific management goals included the establishment of population objectives for mule deer (40,000) and elk (1,200) winter ranges. Desired vigor ratings, cover densities and utilization levels for browse on each mule deer key winter range area are identified. Fifty-six habitat improvement projects were proposed to improve existing habitat conditions for mule deer, elk, sage grouse and fish. Two projects were also identified to develop new aquatic and riparian habitat for waterfowl and shorebirds. These projects are scheduled in coordination with proposed allotment projects to achieve resource objectives for both wildlife and range.

Field studies were conducted from 1976 to 1978 to gather information necessary to base land management decisions. Data collected consists of delineation of sage grouse special use areas, measurement of forage competition between mule deer and livestock on winter range, assessment of vegetation manipulations on non-game wildlife populations, and mapping and characterization of riparian and aquatic habitats.

The White River Resource Area Management Framework Plan (USDI, BLM 1981) dictates that habitat will be managed for all wildlife species in cooperation and coordination with the Colorado Division of Wildlife and the U.S. Fish and Wildlife Service. The Management Framework Plan also provides general guidelines on how this management will occur.

Manipulation of vegetation for improving and increasing forage production for wildlife is an approved management action. The distribution of water can be improved through spring developments and construction of guzzlers or ponds. Wet meadow habitat for sage grouse can be developed by constructing check dams and protectively fencing selected areas. Specific guidelines and constraints for project implementation are described in the Management Framework Plan.

The principle wildlife issue in the White River Resource Area Environmental Impact Statement on Grazing Management (USDI, BLM April 1980) was the allocation of forage. Initial short-term allocation provides 36,160 AUMs of forage to mule deer and elk. Implementation of intensive livestock grazing management would allow for a long-term allocation increase to 40,501 AUMs by the year 2000. These allocations provide adequate forage over the short-term to sustain current mule deer and elk population objectives. The long-term allocation provides for a 12 and 8 percent population increase for mule deer and elk, respectively.

In the White River Resource Area Oil and Gas Leasing Umbrella Environmental Assessment (USDI, BLM February 1982), areas of seasonal restriction and no surface occupancy based on Management Framework Plan recommendations were mapped and legally described. Measures were formulated to minimize surface disturbance from development activities and to facilitate prompt reclamation following project completion. The mitigating measures are incorporated in oil and gas lease revisions, Applications for Permit to Drill, and on associated rights-of-way.

In the Coal Amendment to the Management Framework Plan (USDI, BLM December 1981b), about 4,960 acres were designated as unsuitable for further consideration for surface methods, but suitable with stipulations for subsurface methods of coal development. These areas were restricted based on the requirements of Criterion 11: Bald and Golden Eagle Nests and Criterion 15: State Resident Fish and Wildlife.

BLM is cooperating with the Cathedral Bluffs Shale Oil Company, Rio Blanco Oil Shale Company and Water Users Association Number One to develop and implement habitat management and mitigation plans to avoid or minimize damage to fish and wildlife from these large-scale development projects. BLM is also involved with ongoing field studies and research projects with the Colorado Division of Wildlife and Los Alamos National Laboratory.

CURRENT MANAGEMENT SHORTFALLS

Fifty-two percent of the proposed Habitat Management Plan studies and projects have not been accomplished as originally scheduled due to insufficient funding and manpower. Since 1980 was the last year for Habitat Management Plan implementation, Habitat Management Plan projects were rescheduled for 1981 to

1988 (pending adequate funding) in conjunction with implementation of the White River Grazing Environmental Impact Statement (USDI, BLM April 1980).

Project and habitat monitoring has not been performed since 1977 also due to manpower deficiencies. Therefore, wildlife, grazing and planning objectives within the planning area are not being met. Reseeding of disturbed areas to benefit wildlife has not been adequately implemented. Methodology needs to be developed, especially in oil and gas development areas and on associated rights-of-way projects, to more successfully mitigate forage impacts to wildlife.

Improvements are also needed in the enforcement and monitoring of seasonal restrictions and no surface occupancy stipulations on energy development projects.

RESOURCE CONDITION AND TREND

Due to the lack of adequate project and habitat monitoring, a discussion of the affect of existing management practices on wildlife habitat condition and trend is limited. The existing seasonal restrictions and no surface occupancy stipulations have been effective when applied to mineral leasing projects especially oil and gas. However, in other situations their effectiveness has been extremely limited.

Large scale implementation of forage allocation, habitat condition goals and allotment mangement plans have not been in effect long enough for long-term benefits to have been achieved. Most site-specific habitat improvement projects have improved habitat conditions on the project site and in local adjacent areas. These projects are not of sufficient size to affect overall conditions of the planning area.

Elk and especially mule deer populations have increased steadily since the severe winter of 1978. Colorado Division of Wildlife harvest objectives have promoted stabilization of elk populations, but allow for deer numbers to increase until deer herd objectives are achieved. Population expansion is a result of consecutive mild winters and seasons of good forage production rather than a direct result of management.

DEMAND AND DEPENDENCY

Hunting is the most important recreation opportunity provided by the wildlife resource. Big game hunting attracts the greatest number of recreationists and provides the most money to the local economy. Small game hunting, trapping, wildlife viewing and photography also occur, but to a lesser extent.

Public lands in the planning area provide the majority of essential habitat for mule deer, elk, raptors, and sage grouse. The survival of these species depends on the habitat components afforded by the public land ecosystems within the planning area. Table III-5 presents estimates of total essential habitat available and the quantity and percentage provided on public lands for the species identified above. Public lands provide essential wildlife habitat and are, therefore, important to users of the wildlife resource.

TABLE III-5
ESTIMATE OF ESSENTIAL WILDLIFE HABITAT AVAILABLE IN THE PLANNING AREA

Species	Habitat Feature	Acreage		
		Public Land	State	Private
Mule Deer	Severe Winter Range			
	Winter Concentration Area			
	Winter Range			
Elk	Summer Range			
	Winter Range			
	Resident Population			
Mountain Lion	Winter Range			
	Concentration Area			
Sage Grouse	Brood Habitat			
	Winter Range			
	Nesting Habitat			
Raptors	Buffer Zones			
	No Surface Occupancy			
Bald Eagles	Wintering Areas			
	Concentration Areas			
Colorado River Squawfish, Humpback Chub	Overall Distribution			
Colorado River Cutthroat Trout	Overall Distribution			

h. THREATENED AND ENDANGERED SPECIES

WILDLIFE

Current Management

Sufficient habitat and population of bald eagles, Colorado squawfish, humpback chub and Colorado River cutthroat trout occurs in the planning area to warrant certain special management practices. BLM management of bald eagles, Colorado squawfish, and the humpback chub is difficult since their preferred habitat is located on private land along the White River. Bald eagle habitat management primarily consists of minimizing human disturbance associated with Federally administered actions at roosting, perching and feeding sites during the wintering periods from November 15th to April 15th. Projects with a potential for affecting water quality or quantity in the White River are closely coordinated with the U.S. Fish and Wildlife Service through Section 7 consultation procedures as specified under the Endangered Species Act of 1973. U.S. Fish and Wildlife Service recommendations received in biological assessments provide the basis for the management of Colorado squawfish and humpback chub and the avoidance of adverse impacts to these species and their habitat.

Trappers Creek located on the Naval Oil Shale Reserve, is the only known location of Colorado River cutthroat trout in the planning area. The Naval Oil Shale Aquatic Habitat Management Plan, written in 1982, supercedes prior fisheries objectives and decisions made in the Piceance Basin Habitat Management Plan and guides management efforts toward habitat improvement projects and trout transplants.

Resource Condition and Trend

Management practices to date have been effective in avoiding impacts to threatened or endangered species and their habitat. Since projects which were scheduled for habitat improvement have not yet been implemented, no benefits have been derived. The potential for impacts to threatened or endangered fish species is great due to water requirements for oil shale processing if development occurs. The quality of bald eagle habitat is rapidly deteriorating due to the decline of cottonwood stands along the White River. Habitat for the Colorado cutthroat trout is in poor condition.

PLANTS

Current Management

Current BLM policy is to protect, conserve and manage existing and proposed Federal and State listed threatened, endangered or sensitive plant species. Actions authorized by BLM will provide for the conservation of sensitive plant species and the enhancement and maintenance of their habitat.

There are presently no areas within the planning area that are managed specifically for protection of sensitive plant species. Threatened, endangered or sensitive plant species are currently managed by identifying locations and habitats to ensure protection of these areas whenever possible. On-the-ground surveys by a qualified specialist are required for actions in areas of potential habitat on public land prior to any surface disturbing activity. If threatened, endangered, sensitive or rare plant species are located within the proposed project areas, mitigating measures will be taken to avoid adversely impacting the recorded plant species.

i. CULTURAL RESOURCES

Cultural resources are the fragile, nonrenewable remains of human activity, occupation or endeavor, reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that were of importance in human events (BLM Manual 8100). Cultural resources, both prehistoric and historic, represent a part of the continuum of events from the earliest evidences of man to the present. Cultural resource sites vary in size and range from the location of a single object (isolated find) to a cluster of cultural resource structures with associated objects and features.

Cultural resources on public land are protected by a battery of Federal legislation which dates from the Antiquities Act of 1906 up through the Archeological Resources Protection Act of 1979. The purpose of these laws is to protect significant cultural resources from damage or destruction and to ensure adequate mitigation to preserve the data which these sites possess.

CURRENT MANAGEMENT

The majority of inventories done for cultural resources in the planning area were done by private archaeological consulting firms working for energy companies. These inventories were performed under Antiquities Permits issued by the U.S. Department of Interior and the reports are reviewed and accepted by the White River Resource Area. Block surveys in the area were performed for proposed oil shale development.

One Class II sample field inventory was performed to field test the accuracy of a predictive model developed on contract for the BLM (Newkirk and Roper 1983).

The BLM has designated three classes of cultural resource inventory (BLM Manual 8100).

Class I - Review and synthesis of existing information; literature search.

Class II - Field sampling inventory (10 percent statistical survey is considered a sound sample); a tool for management or planning activities, NOT project clearance.

Class III - Intensive field inventory; 100 percent pedestrian survey.

A class III inventory is required prior to any surface disturbing activity proposed on public land. On Bureau initiated projects, such as range improvements or firewood sales, a Bureau archeologist conducts the inventory. On projects proposed by industry or other government agencies, the Bureau archeologist is responsible for reviewing the technical adequacy of the report prepared by an approved archaeologist hired by the applicant.

When sites are located they must be evaluated for their significance and potential eligibility to the National Register of Historic Places. Avoidance is the preferred and most economical method of avoiding adverse impacts to the cultural resource and project relocation is the most frequently used mitigating measure. If project relocation is not deemed feasible, and the site meets the National Register eligibility criteria, Section 106 consultation with the State Historic Preservation Office is required (36 CFR 800).

The Craig District does not have the manpower or provisions for the surveillance of cultural sites in the planning area. Vandalism does occur but seems to be for recreational purposes, and as a result of increased access and not for financial gain. No known black market activities exist in the planning area.

The identification and protection of sites in the planning area occurs in direct relation to energy development. Current manpower restrictions do not allow for additional survey for purely scientific purposes. Consequently, a cultural resource management plan has not been written for the planning area.

RESOURCE CONDITION AND TREND

The abovementioned cultural resource management practices are considered to be the bare minimum necessary to ensure the protection of cultural resources in the planning area. While the management program used in the planning area is one of the most streamlined and consistent in the state, it is responsive to development needs but does not allow for study leading to the formulation of important research questions.

DEMAND AND DEPENDENCY

The cultural resource management program in the planning area is a support function of other Bureau programs such as lands and minerals, range and forestry. The Bureau is not able to meet the demand for archaeological inventories for industry and this has created the need for private cultural resource consultants in the private sector. The economic affect of industry's cultural resource inventory needs on these consultants has been significant regionally. The current slump in energy development has adversely affected many of these private consultants and some have gone out of business.

j. PALEONTOLOGICAL RESOURCES

Under the mandate of the Antiquities Act of 1906, the National Environmental Policy Act of 1969 and the Federal Land Policy and Management Act of 1976, the Bureau of Land Management is required to identify, evaluate and protect paleontological resources within public lands.

A classification system based on the significance or potential significance of paleontological resources within respective geologic formations has been developed by the Bureau of Land Management. This classification system and the geologic formations the classes occur in (within the planning area), are described in Table III-6. Figure III-7 illustrates the paleontological classifications present within the planning area.

k. RECREATION

CURRENT MANAGEMENT

Public lands are classified into one of two categories for recreation management purposes: special or extensive.

Special recreation management areas (SRMAs), require intensive management to achieve recreation objectives and provide specific recreation opportunities. BLM recreation investments are concentrated in these areas.

Extensive recreation management areas (ERMAs) are areas where significant recreation opportunities and problems are limited and intensive recreation management is generally not required. Limited management actions (access, visitor information, signs, etc.) are usually adequate.

The entire Piceance Basin Planning Area is currently managed as an ERMA, although heavy use during hunting season could justify creation of a SRMA. This includes the provision of access to significant and/or large blocks of public land, visitor information at the White River Resource Area office, signing of access routes and other key features, and trash pick-up at designated sites during hunting season.

The resource area maintains a hunter information station at the area office. It is usually manned by one or two wildlife biologists who are knowledgeable of big game, access, land status, and hunting regulations. Up to 1,500 visitors have utilized this service in a peak season. An effort has been made to have one or two BLM employees in the field to provide information and use supervision, however this function only occurs as time and funding permits.

No effort is made to provide restrooms, dump stations, improved campsites or potable water for the estimated 20,000 camp days spent in the Basin during hunting season. Over 110 concentrated primitive camp areas were identified in 1981 during a cursory field exam. Many additional scattered sites are also

TABLE III-6
PALEONTOLOGICAL CLASSIFICATION SCHEME FOR PUBLIC LANDS AND THE GEOLOGICAL FORMATIONS IN WHICH THE CLASSES OCCUR WITHIN THE PICEANCE BASIN PLANNING AREA

Class I-a:	Areas where immediate detailed study is needed. Fossils of scientific interest are exposed on the surface, or are very likely to be discovered by detailed field work in the area. This classification is to be used for site-specific localities having scientifically significant fossils. No lands with this classification have been identified in the Piceance Basin Planning Area.
Class I-b:	Areas with a high potential for producing scientifically significant fossils. In these areas, a paleontological evaluation will be done by the geologist or paleontologist, on a case-by-case basis, prior to any surface-disturbing activities. These evaluations will change the classification for these areas to Class I-a, II or III, as appropriate. The majority of the lands in the planning area are classified as I-b. The I-b classification is found in the Uinta, Green River, and Wasatch Formations.
Class II:	Areas with evidence of fossils but in which the presence of fossils of scientific significance has not been established and is not anticipated. Detailed study may be desireable in the future for the evaluation of all types of fossil collecting. This classification may be used to identify recreational values of fossils. Small areas with this classification exist around the periphery of the planning area and occurs in the Williams Fork, Iles and Mancos Formation.
Class III:	Areas where there is little likelihood of finding fossils of scientific significance. No further consideration of fossils is necessary unless future discoveries require a change of classification. Alluvial lands in the planning area are Class III and located in the Quarternary Alluvium.

Figure III-7 Paleontological Classifications

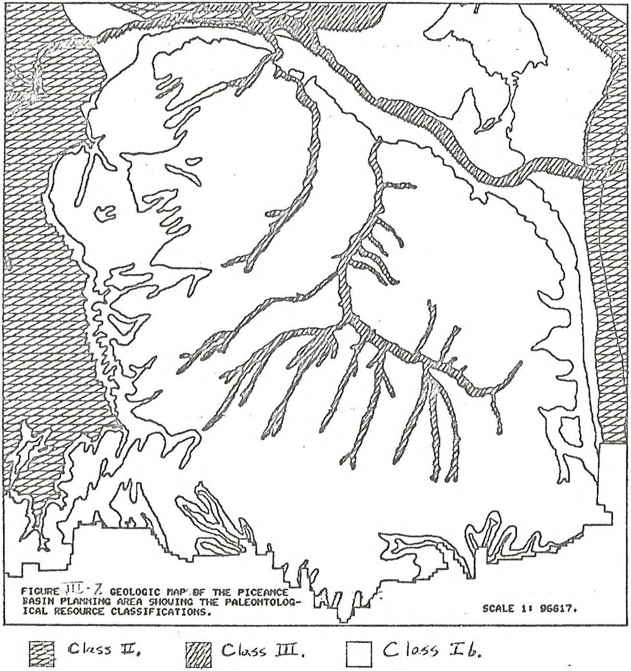


FIGURE III-7 GEOLOGIC MAP OF THE PICEANCE BASIN PLANNING AREA SHOWING THE PALEONTOLOGICAL RESOURCE CLASSIFICATIONS.

SCALE 1: 96617.

heavily used. Most of these areas are in a poor condition, with scattered litter, broken fire rings and beaten down vegetation. Human waste around the sites poses a potential health hazard.

Temporary fire crews are utilized for litter pickup, but generally the litter goes unattended until the following summer. In another effort to control litter, BLM issues a contract for trash pickup at several sites throughout the Basin. This service runs for about a month during hunting season.

The White River Management Framework Plan includes decisions to develop a recreation management plan for the Cathedral Bluffs scenic overlook, develop recreation oriented public information materials, post all major access routes to public lands and complete an OHV plan as required in BLM regulations. Due to a lack of funding, the only recommendation implemented has been posting of some of the access roads.

A recreation opportunity spectrum (ROS) survey has never been completed for the Basin.

RESOURCE CONDITION AND TREND

As outlined in Chapter II, Affected Environment, the primary and almost singular recreation use of this planning area is hunting and camping, mainly related to big game hunting during the fall months with the largest concentrations occurring in October/November.

On opening day of deer/rifle season, as many as 6,400 hunters have been estimated in the Piceance Basin. With the area being 1,038 square miles in size, this makes the hunter density 5.7 hunters per square mile. Anything over 4 hunters per square mile is usually considered to be "overloading" and presents safety problems as well as diminishing the quality of experience (i.e. solitude, etc.). The success of the hunt is very dependent on the cyclic variations in deer populations.

Some dozen major access roads exist providing both physical and legal access to a majority of the public lands in the Basin (see Figure III-8). Access elsewhere in the Basin is limited due to rugged topography and surrounding private property restricting public passage. Because of this, hunting and camping is concentrated along such areas as Cow Creek, Divide Road, Cathedral Bluffs, Calamity Ridge and Yellow Creek Jeep Trail; all are areas with good physical and legal access. Littering, vegetation damage or loss, soil compaction/erosion and vandalism are continuing problems associated with the large number and concentrations of hunters. Also, due to inadequate signing and maps, many hunters new to the area get lost, stuck, delayed or even arrested for trespassing on private lands. Each year BLM receives numerous requests for updated recreation maps. Efforts to obtain public rights-of-way on key parcels is being attempted by the Colorado Division of Wildlife, but is a low priority. BLM, while recognizing this problem, does not have a recreation-driven access aquisition program.

FIGURE III-8

Will show the major access routes and hunting concentration areas

DEMAND AND DEPENDENCY

Hunting opportunities in Piceance Basin are highly sought after. Past national publicity has made Piceance one of the most popular deer hunting areas in the country, and as a result more than half of the big game hunters come from out of state. Competition for undeveloped campsites is fierce since there are few motels and no developed campgrounds within thirty miles of the area. Most hunters arrive several days before hunting season in order to scout out the area and claim a desireable location to set up camp. The demand for these opportunities is expected to remain high, but will fluctuate with cyclic variations in the big game herds and increasing pressure in other hunting areas around the country. An economic and social dependency has been built around hunting in local counties (see Chapter II, Economics Section). With the decline in the energy related industries, local businesses, motels and hotels will increasingly depend upon hunting related business.

While hunting related activities are the major concern of BLM in Piceance Basin, a statewide demand for water based recreation exists which has never been addressed by BLM in the White River Resource Area. Local pressure for fishing, swimming, picnicking, camping, boating and tubing has been placed upon Trapper Lake, Rio Blanco, Rifle Gap and Lake Avery reservoirs for the most part. A few public fishing accesses exist on the White River and these are heavily used. Most river oriented use is directed at the Colorado River, which has more public access and allows public use over the waterway. (The White River is only open to public use where public land lies on both sides of the river.) Demand for use on the White River is presently low.

Demand in the basin for other types of recreation are presently low, and are expected to remain low.

1. VISUAL RESOURCES

CURRENT MANAGEMENT

In addition to the scenic quality discussed in Chapter II, the 1978 visual resource inventory also identified two additional elements - visual sensitivity and viewing distance. Visual sensitivity is the degree of concern expressed by the user toward scenic quality and existing or proposed changes in the landscape. Viewing distance is determined by taking points along designated routes of travel and determining whether viewsheds are in the foreground, middleground, background or in areas that are seldom seen. All three elements - scenic quality, sensitivity and viewing distance - are combined to determine visual resource management (VRM) classes. These five classes establish the degree of acceptable visual change within a characteristic landscape. Management objectives are established for each class. The definitions of each are included in the glossary.

The existing Management Framework Plan, using the 1978 inventory, established VRM classes for the Piceance Basin (see Figure III-9). Proposed activities are evaluated by the contrast rating system in order to quantatively determine a project's visual impact. These ratings determine wether projects are acceptable or unacceptable in the management class they occur in. Those that are unacceptable are redesigned, mitigated, or cancelled. Unmitigatable

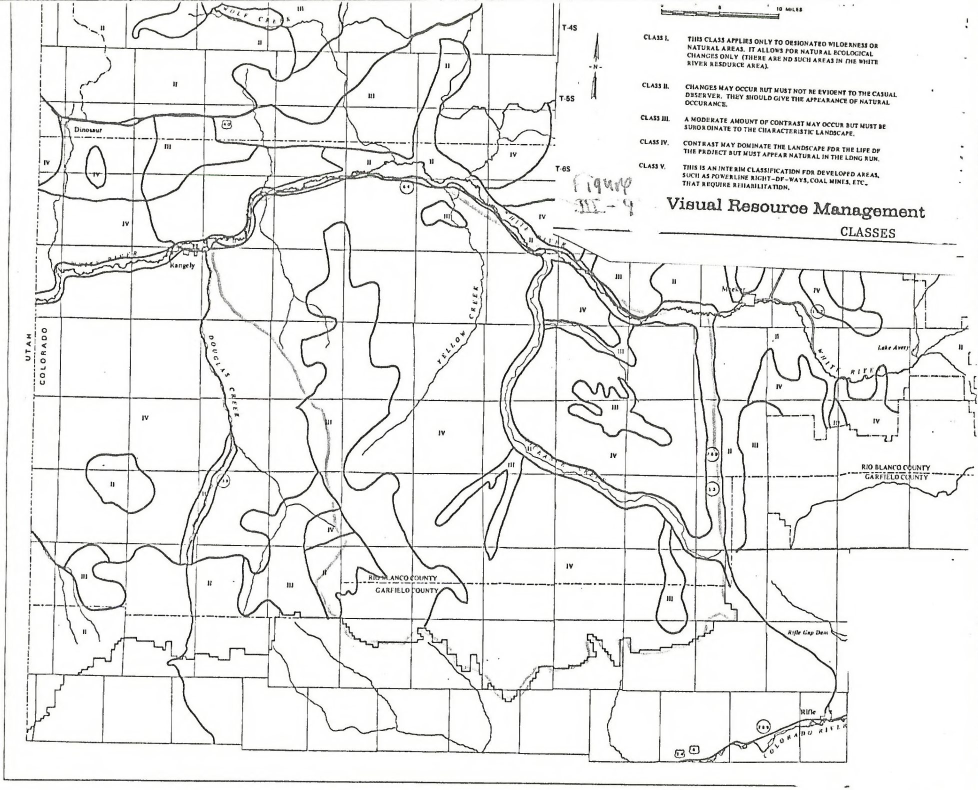


Figure III-9

CLASS I. THIS CLASS APPLIES ONLY TO DESIGNATED WILDERNESS OR NATURAL AREAS. IT ALLOWS FOR NATURAL ECOLOGICAL CHANGES ONLY (THERE ARE NO SUCH AREAS IN THE WHITE RIVER RESOURCE AREA).

CLASS II. CHANGES MAY OCCUR BUT MUST NOT BE EVIDENT TO THE CASUAL OBSERVER. THEY SHOULD GIVE THE APPEARANCE OF NATURAL OCCURANCE.

CLASS III. A MODERATE AMOUNT OF CONTRAST MAY OCCUR BUT MUST BE SUBORDINATE TO THE CHARACTERISTIC LANDSCAPE.

CLASS IV. CONTRAST MAY DOMINATE THE LANDSCAPE FOR THE LIFE OF THE PROJECT BUT MUST APPEAR NATURAL IN THE LONG RUN.

CLASS V. THIS IS AN INTERIM CLASSIFICATION FOR DEVELOPED AREAS, SUCH AS POWERLINE RIGHT-OF-WAYS, COAL MINES, ETC. THAT REQUIRE REHABILITATION.

Visual Resource Management

CLASSES

projects which proceed may downgrade an area's Visual Resource Management class. Activities which cannot meet these objectives in the short-term are placed in an interim category (Class V). Long-term rehabilitation is expected to restore these areas to one of the other classes.

RESOURCE CONDITION AND TREND

Over the past ten years, the scenic quality of the Piceance Basin has undergone a gradual change from an area dominated by ranching and recreation to one dominated by energy development. These changes are related primarily to oil and gas exploration and development, and development on oil shale Tracts C-a and C-b. New roads, powerlines, pipelines and support structures are all associated with this development.

The primary travel route through the Basin is the Piceance Creek Road (County Road No. 5). Much of the energy-related development is screened from this road by the topography of the Piceance Creek drainage and is therefore not visible to travelers on this route.

m. TRANSPORTATION

CURRENT MANAGEMENT

The need for new and improved transportation systems serving the Piceance Basin is directly linked to the demand for development of energy resources. As late as 1981, a boom was predicted in energy resource development. Plans and studies for transportation needs were culminated during this period. By the fall of 1981, demand for energy resources began to taper off due to a declining world market. At present, demand for energy resource development is at a very low point, and thus transportation needs are well covered by existing transportation systems. It is assumed that transportation plans previously completed are still valid but will not be implemented until such time as demand for energy resources dictates expanding production.

In Chapter II roads were described as primary and secondary. Primary roads come under the management of the Colorado State Highway Department, and in the case of Piceance Creek Road, Rio Blanco County is the managing body. Secondary roads are managed by the Bureau of Land Management, Rio Blanco County and, in some cases, by private landowners. Even though the BLM does not directly manage State and County Roads, these roads are an integral part of access to public lands. The BLM is involved with new or improved state and county roads through the permitting process, and through the demand for sand and gravel resources on public lands which are needed for road construction. For these reasons, the management of primary roads will be addressed in this section in addition to the transportation systems more directly managed by BLM.

Primary Roads

In March 1980, the Colorado West Area Council of Governments prepared a document entitled Colorado West Transportation Plan (Colorado West Council of Governments 1980) (hereafter referred to as the Plan), which addresses the impacts of increased energy development on the regional transportation systems of Garfield, Mesa, Moffat and Rio Blanco Counties. Included in its transportation concerns are the regional highway network, airports, rail and pipeline systems. A supporting technical document for the Plan is the Piceance Creek Roadway Report which gives an analysis of alternative routes into the Piceance Creek Basin.

Three different growth scenarios were developed in the Plan in order to forecast future transportation needs for the region. Scenario I was based on natural population growth without energy development, Scenario II forecasts energy development on a moderate scale; and Scenario III was formulated to address a maximum feasible rate of development. Recommendations of the Plan are based on Scenario II. As of 1983, growth has occurred closer to Scenario I, and thus many of the projected needs of 1985 are not valid for that date, but may become valid at some future date.

The Plan indicates that the existing highway network provides a reasonable pattern of connections for regional needs, with the possible exception of additional needs for access into the Piceance Creek Basin. The Piceance Creek Roadway Report investigated various alternatives for access into the area. The top priorities for improved access were listed as a C-a Tract to Rangely route, and to a lesser extent, C-b Tract to DeBeque. These routes would serve commuters and energy site development traffic.

Additonal recommendations of the Plan that have direct or indirect implications on the management of public lands are as follows:

- Haul truck volumes will be a significant problem on highway links and will pose major problems on adjacent communities. Therefore, rail and pipeline systems should be available on a schedule that coincides with large scale energy development. Construction of rail and pipeline systems is a private sector responsibility. The public sector would be involved through the permit process which provides rights-of-way across public lands. Common carrier pipelines and joint use of utility corridors should be encouraged as a means of minimizing environmental disruption. Because even interim (construction and inital production) periods of hauling by truck would seriously impact the highway system, it is recommended that no plant be permitted to produce more than 15,000 barrels of shale products a day without shipment by pipeline.

- Additional electrical transmission lines should be, to the extent possible, located in joint utility corridors.

- A roadway plan for access into the Piceance Creek Basin should be adopted when development demands justify the need.

- A significant portion of the commuting trips of the region's energy workers should be transported in high occupancy vehicles such as van pools, carpools and special buses.

- An extension of rail facilities into the Piceance Creek Basin which connects the rail terminus at Colowyo Coal Mine north of Meeker to energy sites in the Basin would have a beneficial effect on highway needs.

- Through the permitting process, require simultaneous completion of energy projects and their related rail and pipeline links. This will minimize product-haul impact to communities and the regional highway system.

The Colorado State Highway Department was contacted concerning planned improvements to roadways in the Piceance Basin region. It was reported that no plans exist at this time. It was further related that the department has no plans to take Piceance Creek Road into the State Highway System (Leonard 1983). The Rio Blanco County Capital Improvements Program had targeted $4.2 million for the widening of Piceance Creek Road from 30 feet to 36 feet. Construction was to take place between 1982 and 1984. There are no current plans to implement this construction (Payne 1983).

Secondary Roads

BLM roads are inventoried and managed through the Craig District Transportation Plan. BLM roads are those roads necessary to allow access to the public lands for multiple use management. The District Transportation Plan, updated in 1979, outlines the road and trail needs identified through the Bureau's planning system. Another function of the District Transportation Plan is to coordinate transportation needs with the State and County. A Memorandum of Understanding has been arranged between the BLM, Craig District and Rio Blanco County for the construction and maintenance of a portion of the C-a Tract to Rangely road. The Calamity Ridge section of the road will remain a BLM road, but will be managed by the County with BLM input. The road has been partially constructed from the C-a Tract to Calamity Ridge Road. The final section (Phase III) has not been constructed and remains to be permitted by the BLM.

The Management Framework Plan (USDI, BLM 1981) has identified access needs in the Piceance Basin for minerals development and BLM management. In some cases, these access routes cross private lands. During the summers of 1981 and 1982 an on-the-ground inventory was completed for roads in the Piceance Basin. The inventory lists BLM, County, private, oil and gas roads and trails, which are delineated on map overlays and on 7.5 minute USGS quads and are on file at the White River Resource Area office in Meeker.

The Oil and Gas Umbrella Environmental Assessment (EA) identifies access problems and mitigating measures. This document establishes policy and guidance on the location, design, maintenance and reclamation of oil and gas access roads. The preferred alternative of the EA proposes a five year plan of development. As a lease stipulation, a five year plan of development would be submitted to BLM by the lessee prior to any drilling on the lease. The five year plan would require plans for placement and construction of main access roads into an area, and plans for product transportation out of an area. The purpose of this would be to develop a logical transportation plan for leases within an area that combine access and production lines into and out of the area; parallel roads and pipelines could be eliminated. Such planning efforts could decrease access road mileage by approximately 27 percent, pipeline mileage by approximately 35 percent, and eliminate a corresponding amount of surface disturbance. The preferred alternative is to be implemented over time with voluntary acceptance by industry. To date only one company, Rio Blanco Natural Gas, has submitted a tentative five year plan for a lease within the Piceance Basin. Because of the voluntary nature of implementing five year plans, the success of using this management tool is limited.

Special stipulations for mitigating access impacts are developed in the permitting process and are made a part of Applications for Permit to Drill and rights-of-way. Stipulations are developed by onsite investigations, and are tailored to site specific conditions. Technical aspects of road design, construction and reclamation are made available to operators. Oil and gas bonding is considered an assurance that reclamation is accomplished in a reasonable manner, but the Oil and Gas Umbrella EA has pointed out that bonding is a weak method for insuring successful reclamation.

Railroads

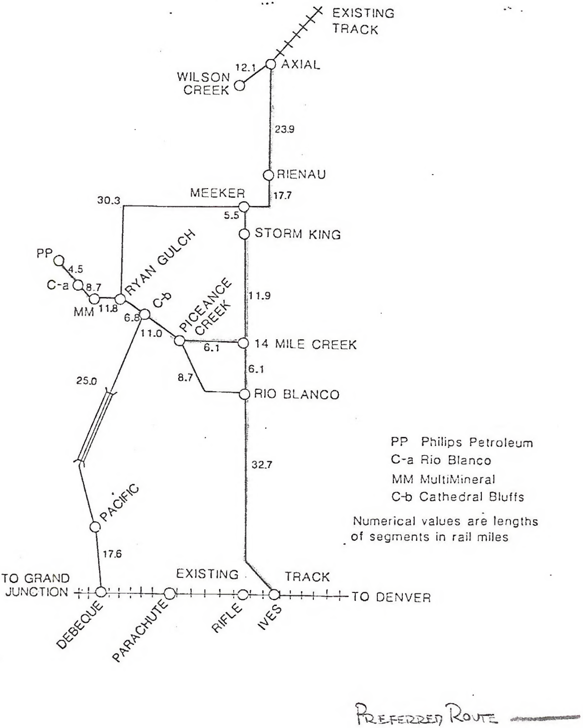
In July of 1981 the Meeker-Piceance Basin Rail Feasibility Study was completed by URS Engineers for the Colorado West Area Council of Governments. The study was initiated to determine the feasibility of new railroad lines into the Piceance Basin. A market survey found that eleven firms associated with mineral development in the Piceance Basin were interested in receiving rail service for proposed projects. Although all of the oil shale companies surveyed indicated pipelines to be the preferred mode of product shipment, it was calculated that pipeline systems could not come close to meeting projected capacity requirements for the region. It was estimated that a 50,000 bbls/day facility would require at least 15 cars per day. Of the six alternative routes investigated, one was selected as environmentally preferable and economically feasible. The selected route is 159 miles long and would extend north from Rifle past Meeker to connect with the Denver and Rio Grande branch line south of Craig. A spur from this connector tract would extend approximately 50 miles into the Piceance Basin. The route is depicted in Figure III-10 (URS Engineers 1981). The study reports that the preferred alternative is just barely economically feasible without direct government assistance.

RESOURCE CONDITION AND TREND

New construction of "temporary" roads and pipelines is directly proportional to the growth rate of oil and gas development. Oil and gas development in the planning area has taken place at an accelerated rate since 1975. The rate of development began to slow in the fall of 1981 due to declining world markets. The impact of accelerated development since 1975 has been a series of surface disturbances that individually are minor but cumulatively are significant. Some of the effects are loss of topsoil, erosion, siltation of waterways, loss of grazing resources, loss of wildlife habitat, loss of scenic values and increased air pollution due to dust. Current management practices attempt to mitigate these impacts, but some impacts are inevitable regardless of the practices followed. Implementation of the five year plans could be most successful in reducing impacts by reducing the amount of surface disturbance necessary to maintain production levels.

Figure III-10

PROPOSED RAIL SEGMENTS



DEMAND AND DEPENDENCY

Demand for transportation in the Basin is directly related to the demand for the mineral resources located there. Effective transportation systems are an integral support function for development of these resources.

Mineral resource development has increased at a rapid pace over the past decade. Presently, a world oil glut has reduced demand for oil, gas, oil shale and coal. There has been a corresponding decline in demand for many other minerals. Historically, mineral development has followed a boom and bust cycle. It is expected that this cyclical phenomenon will continue and, at some point in the future, demand will again increase. Plans and management situations for transportation systems are still valid but will occur at a slower pace.

n. LANDS AND REALTY

The lands and realty program is charged with legally authorizing the use of public lands. The program is broken down into energy and non-energy uses which may be defined by use authorizations and land title transfers. Use authorizations involve rights-of-way, temporary use permits, land use permits and leases where private, corporate and governmental intenties use public lands for project location. Land title transfers include exchanges, acquisitions, recreation and public purposes, sales or such actions involving eventual transfer of title between intenties.

USE AUTHORIZATIONS

Rights-of-Way

In addition to the oil and gas pipelines identified in Chapter II, Transportation, numerous rights-of-way have been issued for oil and gas access roads, electric powerlines and utilities associated with the oil and gas development. Detailed descriptions and the location of each one may be obtained from the White River Resource Area office. Rights-of-way are processed and approved by the White River Resource Area staff as the need occurs. This process consists of a multiple-use conflict analysis and resource mitigation before authorization is offered.

Temporary Use Permits

Temporary use permits are issued to authorize temporary use of public lands in conjunction with a right-of-way, and therefore are analysed through the right-of-way process.

Leases, Permits and Easements

Section 302 of the Federal Land Policy and Management Act of 1976 (FLPMA) provides use authorization under certain conditions for varied periods of time. These authorizations are considered on a case by case basis. While most of these authorizations within the Piceance Basin are associated with oil shale development, the law provides for a wide variety of uses.

Utility Corridors

Linear utility and transportation facilities form a utility corridor network in the planning area. There are 13 major corridor routes that have been identified as potential utility cooridors by the White River Resource Area Management Framework Plan (USDI, BLM 1981). Additional routes exist within the planning area as informal corridors. These informal corridors are "de facto" corridors through existing uses or projected uses, but were not addressed in the Management Framework Plan. See Figure III-11 for the location of utility corridors within the planning area. Approximately 53,956 acres of private and state lands are contained within these corridors.

Among the informal corridors in the Basin is the corridor established for the LaSal Pipeline. LaSal Pipeline Company proposed to construct 279 miles of 16 inch common carrier pipeline to transport shale oil from the Roan Plateau north of Parachute, Colorado to Casper, Wyoming, with a 12 inch pipeline spur to Rangely, Colorado. The pipeline has not been constructed due to the slowdown in oil shale development, but the corridor remains and may prove to be of significance when and if oil shale development accelerates. Utility corridors in the Basin have never been formally designated.

LAND TITLE TRANSFERS

Sales

The current policy for the disposal of lands in the planning area is to consider proposals on a case-by-case basis as needed for public land administration, private land needs and industrial development under the authority of existing laws. Requests for purchasing public lands in the planning area are rare, and primarily involve small isolated parcels of land with low mineral potential.

BLM is in the preliminary stages of developing an asset management program to identify lands and mineral resources for consideration for sale or transfer from public ownership. An initial asset management inventory identified some acres of public land as potentially meeting the criteria for sale or transfer. These criteria include:

* Lands proximate to cities, towns or development areas.

* Scattered non-urban tracts located so as to make effective and efficient management impractical.

* Lands designated for agricultural, commercial or industrial development as the highest value or otherwise most appropriate use.

FIGURE III-11

Utility Corridors in the Piceance Basin Planning Area

* Lands and minerals that do not qualify for sale under Sections 203(a) or 209(b) of the Federal Land Policy and Management Act but which are suitable for disposal through exchange, or other applicable law.

* Other types of lands and minerals identified for sale in the existing White River land use plan.

When the asset management program is fully implemented, the remainder of the planning area would be categorized as appropriate for retention by the Federal government, or requiring additional studies to determine whether it is appropriate for retention or disposal.

Acquistiton

The only acquisition program in the planning area involves obtaining road access easements. These road easements are obtained primarily to provide access to public lands for hunting, recreation use and to enhance their manageability. Easement needs are identified by the resource program affected and are acquired on a case-by-case basis.

Exchanges

All public land within the planning area is subject to exchange provided it meets the following criteria as defined in Section 206 of the Federal Land Policy and Management Act of 1976:

A tract of public land or interest therein may be disposed of through exchange by the Secretary of Interior:

a) Provided that the public interest will be well served by making the exchange;

b) Provided that the Secretary finds that the values and the objectives which Federal lands or interests to be conveyed may serve if retained in Federal ownership are not more than the values of the non-Federal lands or interest and the public objectives they serve if acquired; and

c) Provided that the land the Secretary finds proper for transfer out of Federal ownership is located in the same state as the non-Federal land or interest to be acquired.
No lands in the planning area are currently under consideration for exchange, and requests for exchange are infrequent.

Recreation and Public Purposes

The Recreation and Public Purposes Act provides for the sale or lease of public lands to State and local governments and nonprofit entities. These lands may be used for numerous public purposes such as parks, picnic areas, rifle ranges, and sanitary landfills. Presently there are no Recreation and Public Purpose Act leases or pending applications in the planning area.

Classifications

Lands classified for disposal will be limited to site specific proposals for recreation and public purposes and statutory land entries.

Withdrawals

Currently, some ______ acres of public land in the planning area are withdrawn for various purposes. The largest single withdrawal in the planning area is for oil shale which includes some ________ percent of the total withdrawn lands. Table III-7 shows the types of withdrawals currently identified in the planning area and the total acreage withdrawn.

BLM is currently reviewing all public land withdrawals to determine whether those lands are being used for the purposes intended, and whether other land tenure arrangements could be used to accomplish the intent of the withdrawal. The intent of this review is to revoke unnecessary or outdated withdrawals.

The withdrawal review is an on-going process, so the status of these withdrawn lands is changing. The location of all currently withdrawn public lands is on record in the White River Resource Area office.

Coordination with Local Governments

In a Memorandum of Understanding (MOU) approved on July 5, 1977, Rio Blanco County and the Bureau of Land Management agreed to coordinate their respective planning and decision processes in the preparation of Land Use Plans and Conditional Use Permits. This agreement involves coordinating applications for rights-of-way and other permitted uses of public lands. The interests of the private landowners are voiced through the County's Utility Corridor Committee which reports their findings to the County Planning Commission. The Planning Commission makes recommendations to the Board of County Commissioners for the final decision of Rio Blanco County to approve or reject Conditional Use Permit Applications. The BLM is not legally mandated to follow the County's recommendations, however it is the BLM, Colorado State Office policy that under the Memorandum of Understanding, County recommendations are incorporated in the Bureau's final decisions. No formal agreement has been established with Garfield County.

Energy development is the dominant use factor influencing the volume of requests for lands and realty actions such as rights-of-way, exchanges, permits, easements and leases in the area.

DEMAND

Use Authorizations

Should energy development within the planning area, and throughout northwest Colorado increase, there will be a need for a variety of rights-of-way and the

TABLE III-7
PUBLIC LANDS WITHDRAWN IN THE PICEANCE BASIN PLANNING AREA

Withdrawal Type	Acres
Air Navigation Aid Sites (PLO 3822) b/	20
Classification & Multiple Use Act b/	21
Coal c/	13,455
Department of Energy a/	1,000
Naval Oil Shale Reserves b/	5,404
Oil Shale b/	
Powersite d/	266
Public Water Reserves c/	5,120
Total Acres	

a/ Withdrawn from all types of appropriation, mineral entry and mineral leasing.

b/ Withdrawn from all types of appropriation and mineral entry with the exception of mineral leasing.

c/ Withdrawn from nonmetaliferous mineral location under the general mining law.

d/ Withdrawn under the conditions of Public Law 359 (43 CR 3730.0-3).

associated temporary use permits on public lands. Linear rights-of-way will continue to be needed throughout the planning area. As the needs arise, there will be the opportunity to consolidate them in existing and potential utility corridors.

Due to the anticipated energy development in the future, there will be an increase in the number of easements, permits and leases issued in association with that development.

Land Title Transfers

Within the planning area, nearly 850 acres of scattered public lands have been potentially identified for future disposal. Public lands in the vicinity of developable areas will also be considered for disposal as the necessity occurs.

Due to the minerals development within the area, there is a potential need for exchanges of private land and minerals with public land and minerals to enhance managability. The demand for exchanges is expected to increase if mineral activity begins to increase.

With the probability of intensive minerals development there could be interest by state, local and county governments, and nonprofit organizations in obtaining public lands for recreation and public purposes.

The demand for major withdrawals should be non-existent in the future. Casework analysis will center on a comprehensive BLM review of all withdrawals.

DEPENDENCY

The distribution of public land causes locational dependencies by private and community entities. Due to the large blocks of public lands within the area, major transmission lines, pipelines and roads must be routed across public lands. A second type of locational dependency arises when ranches and towns are bordered or surrounded by public lands. The Bureau's programs of Recreation and Public Purpose actions and land disposals are intended to alievate community expansion difficulties. Finally, lands suited for reservoir sites or lands with prominent points are often found suitable for communication sites. Most of these lands are located on BLM administered lands.

o. FIRE MANAGEMENT

Wildfire is a naturally occurring phenomenon in the planning area. Fires are usually the result of lightning striking a juniper or pinyon tree, causing ignition. The majority of all fires are small, involving one to several trees and usually involving less than one acre. When fires do increase in size and burn out of control, it is usually during periods of extremely high air temperatures, low relative humidity, low moisture content of trees and vegetation, and they occur in areas of high continuity of fuels. These larger fires typically burn in stands of pinyon-juniper and associated vegetation types such as sagebrush and grasslands. Fire occurrence is highest during late June, July and August.

To date, there is not an approved fire management plan for the Piceance Basin Planning Area. Consequently, all wildfires in the planning area are suppressed with substantial sums of money spent each year to do this.

Extensive preparations are made every summer for emergency fire suppression. The BLM District office maintains a seasonal crew hired specifically for fire suppression. Permanent employees are also assigned to fire teams which are on call throughout the fire season. Temporary employees are trained and equipped to assist as necessary.

Fire fighting vehicles and equipment are maintained to support these crews, and on call support is available for fire suppression from other BLM offices and other Federal agencies in Colorado and throughout the west.

The present wildfire policy was established in the White River Management Framework Plan (USDI, BLM 1981). This guidance is an interim fire management policy, and is in effect until an approved fire management plan is written for the planning area. The need for a fire management plan is recognized in the Management Framework Plan and supported by recommendations from the range, wildlife, watershed and wild horse programs. The cooperative fire management agreement between BLM, U.S. Forest Service and the National Park Service calls for agency exchange of fire management plans. The preparation of a plan is scheduled following completion of the Resource Management Plan.

Fire management is not limited to wildfire, but also extends to the use of fire in the form of prescribed burning. This is primarily a method of vegetation manipulation. Prescribed burn policies and planned accomplishments are included in the White River Grazing Management Environmental Impact Statement (USDI, BLM April 1980). A prescribed burn plan for the planning area was approved in 1982. Currently, approximately 1,000 acres per year are designated for burning, the majority of which is for maintenance of existing chainings and sagebrush manipulations.

DEMAND AND DEPENDENCY

Local communities and industries depend upon the BLM to provide adequate fire management to prevent fires from burning onto private land or facilities. The use of fire as a management tool for vegetation manipulation is expected to increase.

APPENDIX S
SOCIOLOGICAL STUDIES

STUDY OF WOMEN IN MEEKER

Selected items from the longitudinal study of women in Meeker by the Growth Impact Group (Moen 1983) are shown in Table AS-1. Those women who had lived in Meeker for less than five years tended to be less satisfied with their living conditions, their neighborhood, and with community facilities and services than were longtime women residents, though differences are not very great, and there are notable exceptions (such as traffic, animal control, mental health and the local high school).

When compared with women of a control town which is somewhat smaller and more isolated, the satisfaction levels do not follow a consistent trend. Women in that town frequently expressed less satisfaction than their counterparts in the test town (Meeker), and long term women residents were frequently less satisfied than were the more recent arrivals.

This evidence demonstrates that, contrary to popular perceptions, "boom" town life may not automatically lead to a more negative perception of the quality of life nor is it clear that newcomer women, one of the greatest at-risk groups, necessarily feel less satisfied than do oldtimer women.

The table suggests further confirmation of the work of Freudenburg and others (see especially the Pacific Sociological Review, July, 1982, entire issue), that some of the problems attributed to boom towns (e.g., fear for safety, health, alcohol and mental health services) may be less significant than is often supposed.

BLM STUDY OF RIFLE

Additional findings of the 1981 BLM study based on a random sample of 109 persons in Rifle indicate that 29 percent of the respondents felt that local communities have no influence on whether energy production occurs in the area, 41 percent felt they had very little influence, 13 percent said some, and 17 percent said a lot. In-depth interviews with 22 of the respondents revealed, however, that some persons do not believe the local community should have much influence in such decisions. The most common view expressed was that a community should not be able to stop development, but should be able to impose mitigative restrictions on the companies.

Of things liked most about living in Rifle, respondents most often mentioned friendliness of the people, natural beauty of the area, climate, outdoor recreation and small size of the town. Those holding energy-related jobs and newcomers were less likely to mention friendliness of the people. Newcomers often felt that they were not warmly received by the town and that longtime residents were too suspicious of them.

In-depth interviewees ranked wildlife as a highest priority among BLM responsibilities, with watershed second. The other four choices (range, timber, recreation, and energy and minerals) ranked about equally.

TABLE AS-1
SELECTED COMPARISONS OF WOMEN SATISFIED AND DISSATISFIED WITH COMMUNITY ELEMENTS, BY LENGTH OF RESIDENCE, IN PERCENTS

Community Element	Meeker Women				Control Group Women			
	Satisfied		Dissatisfied		Satisfied		Dissatisfied	
	≤ 5 yrs Res.	> 5 yrs Res.	≤ 5 yrs Res.	> 5 yrs Res.	≤ 5 yrs Res.	> 5 yrs Res.	≤ 5 yrs Res.	> 5 yrs Res.
Home	76	85	17	8	82	84	12	8
Neighborhood	77	82	15	9	83	81	9	9
Town	61	65	26	19	57	52	23	26
Neighborhood Stress:								
Nothing	14	7			7	8		
Crowding			19	18			16	10
Traffic			19	25			9	10
Animals			32	41			28	39
Problem Children			12	9			5	10
Fear			3	1			0	0
Services:								
Hospital	39	58	25	21	38	65	18	38
Employment Service	40	39	9	1	16	5	26	10
Mental Health	24	37	4	8	15	25	15	8
Alcohol Treatment	7	8	2	1	11	9	11	0
Facilities & Programs:								
Police	57	67	12	8	47	33	32	36
High School	35	53	20	27	39	52	29	27
Restaurants	13	19	75	59	23	29	58	56
Recreation (adult)	11	30	48	30	19	28	46	27
TV	35	61	53	26	14	22	72	68

N ≤ 5 yrs Residence Meeker = 143
N ≤ 5 yrs Residence Control = 56

N > 5 yrs Residence Meeker = 135
N > 5 yrs Residence Control = 95

Source: Moen, Betsy. 1983 "Community Satisfaction". Growth Impact Group, Program on Population Processes, Institute of Behavioral Science. University of Colorado. Boulder, Colorado. Tables 1, 5, 7, 8 (partial) (Percents rounded).